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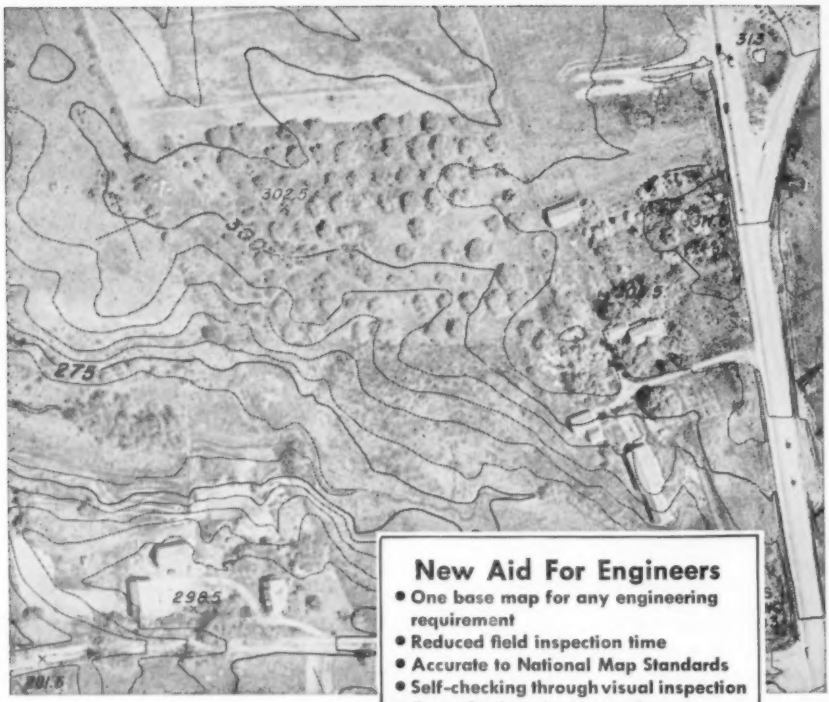

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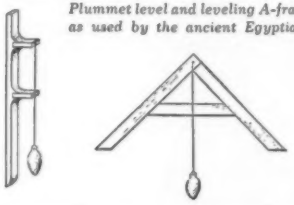

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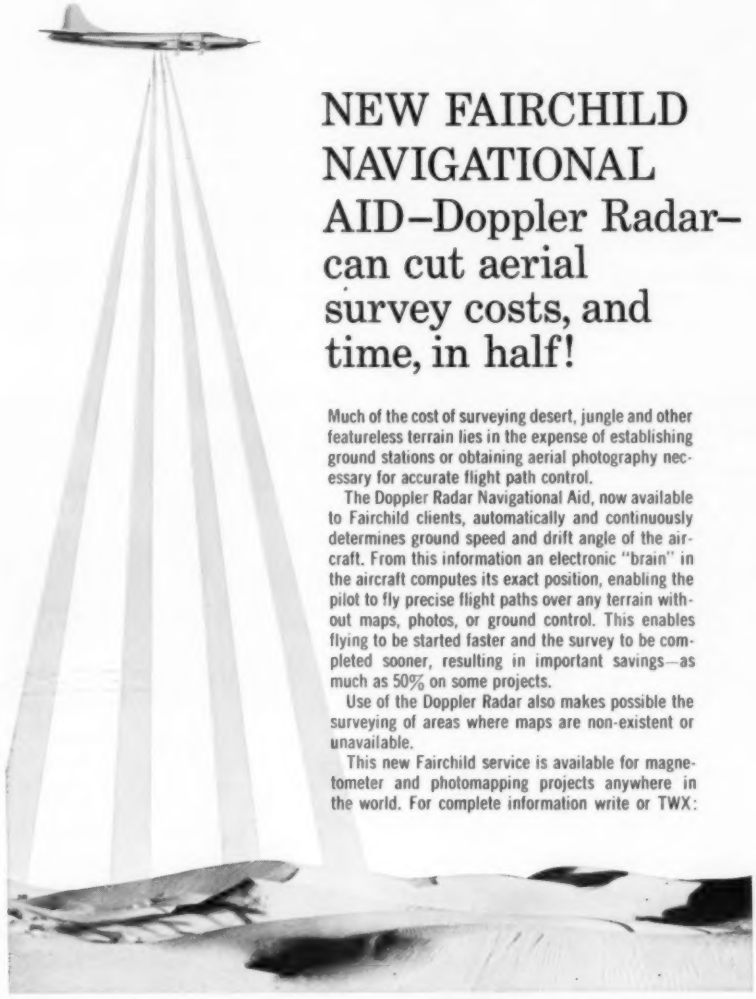

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Salute to Past Presidents

As a preliminary to mixing with convention committeemen and fellow officers of the American Society of Photogrammetry in a joint salute to the Past Presidents of both organizations, the ACSM contingent gathered for a photograph at this auspicious and opportune time during the 1959 ASP-ACSM Convention.

Seated, front row, left to right—Past Presidents Sol A. Bauer, Marshall S. Wright, Robert H. Randall, Lester C. Higbee, and Willfred B. Williams. *Standing, back row, left to right*—Chairman Granville K. Emminizer; Directors Clifford A. Thorpe, Jr., Victor H. Ghent, Everett D. Morse, and John A. Law; Vice President H. Arnold Karo; Chairman Ralph M. Berry; President George C. Bestor; Director Loren A. Bloom; and Executive Secretary Walter S. Dix.

The Nineteenth Annual Meeting

A RECORD of over 2,000 registrations was set this year for the consecutive meetings of the American Society of Photogrammetry and the American Congress on Surveying and Mapping. These annual meetings were held at the Shoreham Hotel in Washington, D. C., during the week of March 8, 1959.

Opening Session

President Willfred B. Williams opened the ACSM plenary session on Wednesday afternoon with a welcome to members and guests. He reviewed the accomplishments of the past year and pointed out some of the problems ACSM will face in the future. President Williams then introduced Chairman Page F. Hopkins to preside over the Topography Division's portion of the program.

In a paper entitled "The Role of the Topographic Map in the Missile Age," Col. Frederick O. Diercks, Commanding Officer, U. S. Army Map Service, described the sweeping changes in mapping requirements which are a direct consequence of the missile-aiming problem. For aiming an intercontinental missile, the positions of launching site and target must be known precisely in terms of latitude and longitude on a spheroid. It is also necessary to have detailed knowledge of the earth's gravity field, inasmuch as some missile-guidance systems rely on that field. One type of guidance system operates by examining the terrain beneath the missile and comparing it with a special map devised from topographic maps. Colonel Diercks pointed out that modern military operations call for high mobility and wide dispersion of forces, giving rise to a great increase in the demand for topographic maps. The real problem, Colonel Diercks stated, is how we can possibly produce the necessary maps rapidly enough to meet any emergency.

The Property Surveys Division took over next, with Chairman A. Phillips Bill presiding. Jasper E. King of the U. S. Forest Service presented a paper on "The Wedding of Cadastral (Land) Surveys to Photogrammetry (And the Future of that Marriage)." The real function of the photogrammetrist in a cadastral survey, Mr. King explained, is the determination of the coordinates of the ground positions desired by the surveyor. He stressed the importance of adequate ground control and prephotography targeting of points. Mr. King cited examples of the use of first-order photogrammetric plotting instruments. Although photogrammetric cadastral operations have been principally directed toward retracement surveys, Mr. King pointed out that the value of this procedure for original surveys is readily demonstrated.

Brother B. Austin Barry, of Manhattan College, discussed "The Status of Surveying and Mapping in the United States," a study sponsored by the American Society of Civil Engineers with some ACSM assistance. The study was published in SURVEYING AND MAPPING, October–December 1958. Brother Barry presented an evaluation of the implications of ASCE action in accepting the findings of the study. A spirited floor discussion followed Brother Barry's presentation.

Cartography Division

Activities of the Cartography Division during the year 1958–59 were highlighted by the assembly of a group of foreign delegates to the Second International Cartographic Conference held in Chicago, Illinois.

In June 1958 a Washington program, sponsored by the ACSM, was offered to the delegates of the Conference after the Chicago meetings had been concluded. This program included a reception at the Library of Congress and conducted tours of the Library, Army Map Service, Geological Survey, Coast and Geodetic Survey, and the National Geographic Society.

Program arrangements for the Fall meeting of the Division were handled by Roy

Nunn, and the details concerning this meeting, held November 6, 1958, have already been published. (*See* SURVEYING AND MAPPING, October–December 1958, Vol. XVIII, No. 4, page 480).

During the Nineteenth Annual Meeting, the Cartography Division submitted the following to the Resolutions Committee of the ACSM:

"It is recommended that the Chairman of each of the six technical divisions of ACSM automatically become a member of the Board of Directors, ACSM, with voting rights. This additional representation on the Board of Directors will further acquaint the Divisions with the inner workings of the parent organization and supply valuable information and contacts to the Chairmen in preparing programs, meetings, etc. The ACSM will also have the advantage of additional manpower to draw from for promotion of the organization throughout the country."

Two new Directors were appointed for 1959–60—Dr. Fred W. Foster, Professor of Geography, University of Illinois, and Robert J. Beaton, U. S. Navy Hydrographic Office.

Numerous requests for cartographic information were received and processed by the Division. A full program, including a greatly accelerated program for dissemination of cartographic data, was proposed for the incoming Board of Directors of the Division.

The following is a résumé of the activities of the Cartogrophy Division during the Nineteenth Annual Meeting:

The first presentation was a panel discussion on "Educational Programs in the Field of Geographic Cartography." Chairman Granville K. Emminizer introduced the following panelists: George F. Jenks, Associate Professor of Geography, University of Kansas; Dr. John C. Sherman, Associate Professor Geography, University of Washington; H. W. Westerman, Assistant Professor of Geography, George Washington University; and Professor Frederick J. Doyle, Ohio State University.

The second presentation of the Division was a program including the following papers: "Air Safety as a Factor in Cartographic Design," by G. M. Goldberg, Aeronautic Chart and Information Center; "Programming Topographic Maps for Automatic Terrain Model Construction," by A. A. Noma and M. G. Misulia, Army Map Service; "The Map Information Office of the U. S. Geological Survey," by J. O. Kilmartin, U. S. Geological Survey; and "Development of Perspective Portrayals for Aircraft Instrument Approach and Landing Charts," by D. O. Main, U. S. Navy Hydrographic Office.

The Plenary Session sponsored by the Cartography Division, Chairman Emminizer presiding, presented the following: "A Paper on International Cartographic Cooperation," by Dr. Carl M. Mannerfelt and presented by Duncan Fitchet of Rand McNally & Company. Mr. Fitchet followed the reading of this paper with a presentation of his own entitled "Report on the Meeting Held at Mainz, Germany, Relative to Establishment of an International Cartographic Organization." Rear Admiral Charles Pierce, Assistant Director, Coast and Geodetic Survey, presented a paper entitled "Charts for American's Fastest Growing Fleet."

Control Surveys Division

The Plenary Session, allotted to the Control Surveys Division, consisted of a panel of representatives of Federal agencies and State highway departments who discussed the relation of geodetic surveys to the Interstate Highway program. Chairman Lansing G. Simmons, Coast and Geodetic Survey, presided and served as moderator for the panel.

Fred W. Haxton, Chief of the Interstate Development Branch, Bureau of Public Roads, outlined the responsibility of his agency for providing general guidance and supervision of the improvement of the 810,000 miles of the nation's public roads. He pointed out that legislation had been enacted to establish permanent geodetic markers along the full extent of these roads. However, the projects to date have been limited to the 41,000 miles of the Interstate Highway System. He stated that the Coast and Geodetic Survey had been authorized to cooperate with other agencies in helping to execute the responsibilities of the Bureau

of Public Roads. The Coast and Geodetic Survey has served as consultant as well as project engineer in many of the States.

L. L. Funk, Photogrammetric Engineer, California Division of Highways, spoke of the use of a Tellurometer and Model 3 Geodimeter in helping to reduce the costs of establishing control along the highway routes. Over 1,000 second-order points were established during the past 18 months along approximately 700 miles of the proposed routes.

Charles E. McNoldy, Chief Photogrammetrist, Pennsylvania Department of Highways, described the program for establishing geodetic control along 900 miles of proposed routes in Pennsylvania. Because several sections of the Pennsylvania system are in areas where there had been no geodetic control, a basic framework needed to be established as well as the more closely spaced points for horizontal and vertical control near the proposed centerlines.

George W. Cassell, Highway Engineer, Maryland State Roads Commission, described the development of the program in his State. As of January 1, 1959, horizontal control for 310 miles and vertical control for 261 miles, out of the proposed 354 miles, had been completcd. Because of the available geodetic control, there had been a substantial saving in the contracts for the large scale mapping along the proposed routes.

F. B. Bales, Photogrammetric Engineer, Virginia Department of Highways, told of the progress which has been made in the establishment of control along 1,000 miles of the Interstate System in Virginia. The Virginia Highway Department is making full use of the Tellurometer and electronic computers in extending and processing these surveys.

Each of the State representatives had cost data, but because of the lack of a common base for costs it was difficult to compare the figures presented by each speaker. They were all in agreement, however, that substantial savings had been made through the use of electronic distance-measuring equipment. It was also pointed out that a great deal of work remained to be done in all the States.

At the Control Surveys Division Business Meeting brief reports were submitted by Emery T. Snyder, Chairman of the Membership Committee; Julius L. Speert, Chairman of the Research and Development Committee; and Professor Ralph M. Berry, Chairman of the Public Education Committee.

Professor Arthur J. McNair, Chairman of the Nominating Committee, was not present but his report was presented by the Secretary of the Division, James B. Small. The Nominating Committee had selected Julius L. Speert, U. S. Geological Survey. He was unanimously elected to serve for a three-year period. The other two Directors of the Division are Richard G. Watts, Magnolia Petroleum Company, Texas, who will be Chairman of the Division in 1960, and Daniel E. Whelan, Jr., Dean of Engineering, Loyola University, Los Angeles.

Following the Business Meeting O. S. Reading, Captain, Coast and Geodetic Survey (retired), reported on the precise surveys being made, under his direction, at the site of a large synchrotron at Brookhaven National Laboratory. Captain Reading's paper will appear in a later issue of SURVEYING AND MAPPING.

Dr. John A. O'Keefe, National Aeronautics and Space Administration, presented a very interesting report on the Artificial Satellite Program as applied to geodesy. Dr. O'Keefe told of the significant results being obtained through the studies of the second and third harmonics of the satellite orbit.

Education Division

Dr. John R. Ryder, Dean of the College of Engineering, Michigan State University, spoke before the Plenary Session, sponsored by the Education Division, on the subject "Are Our Engineering Colleges Modern?" Dr. Ryder reviewed the present trends in modern education which require a broadening of the curricula at all levels with the result that surveying courses are frequently curtailed. Instruction in surveying, under this modern trend, will become a function of the technical institute rather than that of an engineering university.

EDITOR'S NOTE.—We cannot but question who will educate the teachers of surveying for the technical institutes. Furthermore, if surveying is removed from the university, what will become of the research and development in these fields?

At the business meeting of the Education Division, Professor Calvin W. Tooles of the Virginia Polytechnic Institute was elected as a new Director of the Division. The Directors for the coming year are: Francis H. Moffitt, *Chairman,* Eldon C. Wagner, John O. Eichler, and Calvin W. Tooles.

After a lively discussion, a committee was appointed to study possible sources of financial aid and procedures for handling such aid, to encourage students in the fields of Surveying and Geodesy. Professor John O. Eichler, Georgia Institute of Technology, was appointed as chairman of this committee.

A committee was appointed to study the relation and need of surveying in the fields of Engineering, Geography, Cartography, and related sciences. Professor Winfield H. Eldridge, University of Illinois, was appointed chairman of this committee.

Instruments Division

At the Plenary Session, sponsored by the Instruments Division, Leonard W. Andrukonis, Engineer Research and Development Laboratories, Fort Belvoir, reported on the development of an automatic tracking theodolite, an automatic position surveys device, a gyro-orienter, and an airborne electronic distance-measuring instrument.

Professor Philip Kissam, Civil Engineering Department, Princeton University, presented a paper on the techniques for obtaining observations which can be used to evaluate the accuracy of the circles of a transit. Professor Kissam emphasized the fact that the quality of the circle determines the quality of the transit. He presented techniques which may be used by anyone owning a transit to determine the magnitude of the errors caused by poor graduations.

Property Surveys Division

The Property Surveys Division participation in the Nineteenth Annual Meeting consisted of two plenary sessions, a technical session, and a business meeting.

The first plenary session, held Wednseday afternoon, March 11, featured an interesting paper entitled "The Wedding of Cadastral (Land) Surveys to Photogrammetry (and the Future of That Marriage)," presented by Jasper E. King of the Division of Engineering, U. S. Forest Service; and a discussion of the recently published ASCE report on "The Status of Surveying and Mapping in the United States" by Brother B. Austin Barry, Associate Professor of Civil Engineering, Manhattan College.

Mr. King introduced by Division Chairman A. Phillips Bill as a crusading pioneer in the expanding use of photogrammetric methods in surveying and mapping, gave a detailed description of test projects carried out by the Forest Service in developing a photogrammetric system for surveying in the 181 million acres of national forest lands. Basically, the system involves, first, the marking of all corners that can be found, or visible points nearby, or, when points cannot be found, near their probable locations. The marking is done with panels prior to photographing the area. The coordinates of these points are then determined by photogrammetric triangulation controlled by ground triangulation within or near the area. The tests indicate, he said, that points can be established with an accuracy of 1 or 2 feet in most cases.

Brother Barry, Chairman of the Task Committee on the Status of Surveying and Mapping of the American Society of Civil Engineers, explained the thinking of the committee which lay behind the final report which was published in the October–December 1958 issue of SURVEYING AND MAPPING, and described the actions taken by ASCE at the time of presentation of the report. He indicated the effects that the report could ultimately have on the land surveying profession and on engineering education, and made a sincere plea for the forsaking of private and petty interests in working out the future in a judicious yet energetic manner. Perhaps paramount in the committee's mind was a concept of the future "when the professional engineer-sur-

veyor will no longer be held by law to one restricted operation by one restricted method; when he will be able, because he is competent, to use new principles and instruments as they are developed; and when his scope will thus be expanded."

On Thursday morning the Division held a technical session, designated as the Land Surveyors Annual National Conference, comprising reports from three Division committees. Taken together, these reports give an inkling of the great amount of activity and accomplishment by the Division during the year.

James L. Bell, Chairman, read the report of the Fees and Salaries Committee and led the discussion which followed. Essentially, the report consisted of an explanation of the very comprehensive tabulation of results of a nationwide, State-by-State survey of fees and salaries, copies of which had been distributed to the audience. In the discussion which ensued, Mr. Bell pointed out that it was not the intention of the committee to seek national standardization of fees and salaries, but, rather, to provide a guide for use at will in various parts of the country.

In the absence of Curtis M. Brown, Chairman of the Model Surveyors Registration Law Committee, L. T. Schofield read the report of that committee. The report developed the information that the suggested model law presented at the 1958 Annual Meeting envisaged separate registration of surveyors and civil engineers, whereas the ASCE Task Committee report proposes the possibility of an ultimate merger of registration. Faced with this conflict, on the one hand, and, on the other hand, with information that the National Council of State Boards of Engineering Examiners had recently established a committee to consider revisions of their model law, the committee suggested that, while progress on a model law is now more urgent than ever, it might best be confined to a step-at-a-time program, the first step of which would be the determination of the sentiments of the Division members as to which direction to proceed. The committee strongly recommended that, in any event, surveyor registration standards should be upgraded as one means of attaining and maintaining professional stature.

The report of the Ethics Committee was given by Victor H. Ghent who has, for the past year, served as acting Chairman of the committee for Sol A. Bauer, the Chairman. The committee report traced developments since presentation of a basic Code of Ethics at the 1958 meeting. The Code has been adopted by the Division and permission has been given by the ACSM Board of Direction to publish the code as an official statement of the Division (published elsewhere in this issue of SURVEYING AND MAPPING), pending consideration by the Board of Direction for possible Congress-wide adoption. The committee recommended that the Division establish a standing committee on ethics to press for closer coordinated interpretations of the Code.

Continuing the Land Surveyors Conference on Thursday evening, Victor Ghent, Division Secretary, introduced Division Advisors—officially appointed representatives from local sections and affiliated organizations. A total of nearly two dozen unofficial and official representatives from all parts of the nation were presented. Several of the Advisors presented problems for discussion and possible Division action.

At the Division business meeting which followed, five resolutions were presented and approved. These included a request, introduced by Mr. Bell, that the Board of Direction and officers of ACSM prepare a roster of Property Surveys Division members. Secretary Ghent presented resolutions (1) approving the Ethics Committee report and establishing a standing Ethics Committee; (2) complimenting the Model Law Committee and continuing the committee; (3) approving and recommendations of the Fees and Salaries Committee and continuing the committee for another year; and (4) requesting that the Board of Direction of ACSM take steps to secure prompt publication of the Fees and Salaries Committee report.

Two additional committees were established by the Division. The first is a panel committee to investigate the surveyor's posi-

tion in town and city planning and the possibilities for the surveyor to be of greater service to the public in this regard. The second committee, to be staffed by members distributed across the country, is to study and report on legal recording of survey documents and records.

As the result of a unanimous ballot cast in favor of the candidates proposed by the nominating committee headed by Newell Snow, the following slate of new Division officers was elected:

A. Phillips Bill, *Chairman*
James L. Bell, *1st Vice Chairman*
W. J. Reese, *2nd Vice Chairman*

Chairman Bill reappointed Victor H. Ghent as Division Secretary for another year. Mr. Ghent was given a rising vote of thanks by the audience for his many major contributions to the Division and for his tireless efforts in its behalf.

On Friday afternoon the Division sponsored a second plenary session featuring a paper by George C. Bestor, now President of ACSM, on "Observations of Surveying in Europe." Mr. Bestor presented some of the highlights of his trip with the then President of ACSM, Willfred B. Williams, to the Ninth Congress of the Federation Internationale des Geometres at Delft, Holland, August 27 to September 4, 1958. He dsecribed the work of each of the seven commissions of the Federation and pointed out many interesting differences in viewpoints, in methods, in terminology, and in problems and approaches to their solution between the various countries represented. Membership in the Federation, he explained, is by national societies, with twenty-one nations represented at the close of the Congress. The only United States organization officially represented in the Federation, he said, is the American Institute of Real Estate Appraisers. He added, however, that the ACSM Board of Direction would consider future relations with FIG at its coming meeting.

Topography Division

The program feature of the Topography Division session on Friday morning was a panel discussion on "Requirements and Methods for Producing Topographic Maps," Chairman Page F. Hopkins presiding.

Harold J. McMillen, U. S. Geological Survey, opened the discussion by outlining the requirements for 1:24,000 scale topographic maps. Mr. McMillen described Geological Survey research in the present-day use of maps, as a guide to the shaping of mapping policy. He reviewed the existing specifications for the accuracy and content of maps and pointed out the need to keep the requirements squarely in mind as a basis for developing efficient mapping techniques.

Alfred O. Quinn, Chief Engineer, Aero Service Corporation, spoke on the modern techniques used in preparing a wide variety of maps ranging in scale from 1:1,000,000 to 1:2,400. Many of the projects have been in remote areas. He emphasized that the successful completion of a map is a function of the materials and equipment used, and pointed out that the most essential factors are the knowledge and experience of the personnel responsible for planning and producing each individual operation.

Marvin L. Wilson, Chief Cartographer and Assistant Highway Engineer for the Connecticut Highway Department, discussed the preparation of large scale mapping in connection with highway design and highway improvement. He used several illustrations to show the advantages of photogrammetric mapping for the highway program in Connecticut.

Frank C. Riley, an associate of Park Aerial Surveys, Inc., discussed the methods and procedures involved in compiling maps for highway departments. He described the general procedure for obtaining aerial photography and then extending adequate horizontal and vertical control for the compilations. He also stressed the requirement for mapping in the development of the Interstate Highway System.

Bueford Hayden, of Mott & Associates, Washington, D. C., explained what a firm of Land Planning Consultants expects of a large-scale topographic map. To illustrate the needs, Mr. Hayden outlined the steps in

the layout of a shopping center, emphasizing the role of the topographic map in such a project. The planner expects the map to be 100 percent correct with respect to items of information, Mr. Hayden stated, and he expects horizontal and vertical accuracy to meet National Standards of Map Accuracy.

Harry Johnson of Lockwood, Kessler and Bartlett, Syosset, New York, discussed the various steps and operations required to produce a large-scale topographic map by photogrammetric methods. Mr. Johnson pointed out that although the typical photogrammetric map contains a great deal of information, it does not include the 100% of detail expected by Mr. Hayden. The missing data must be developed from on-the-ground surveys.

A brief business meeting was held, during which Topographic Division officers for next year were elected, as follows:

Chairman—Charles W. Buckey, U. S. Geological Survey

Director (from government)—Chester E. Kowalczyk, U. S. Navy Hydrographic Office

Director (from private organization)—Frank C. Riley, Park Aerial Surveys, Louisville, Kentucky

Business Meeting

Wilfred B. Williams, President of ACSM, presided at the Annual Business Meeting, held Friday afternoon, March 13, 1959. The first item on the agenda was the presentation of two honorary memberships.

Sol A. Bauer was called to the platform and presented a certificate of honorary membership in recognition of his distinguished services to ACSM. Mr. Bauer organized the Property Surveys Division in 1944, was appointed its first chairman, and served in that office for five years until he was elected president of ACSM in 1950 to become the sixth president of the Congress.

The second honorary membership was awarded Admiral K. T. Adams, who was not present. Admiral Adams is a charter member of the Congress and had served in various capacities, including Director, Publications Committee Chairman, and Budget Committee Chairman. Admiral H. Arnold Karo accepted the certificate in his behalf and stated that he expected to see Admiral Adams within a few weeks and would extend to him the personal greetings of the members of the Congress.

TREASURER'S REPORT

Captain Henry W. Hemple, Treasurer, submitted his report. Details of this report were published in SURVEYING AND MAPPING, March 1959, Vol. XIX, No. 1, page 130.

MEMBERSHIP COMMITTEE REPORT

Captain Frank S. Borden, Chairman of the Membership Committee reported as follows:

The paid individual membership of the Congress for 1958 was 4,920. Up until March 1 of this year 219 new members have been added, making a total of 5,139. The paid library membership for 1958 was 747.

The net gain in individual membership during 1958 was 853. Since this is considerably larger than for any previous year, I would like to take a few minutes to inform you briefly of some of the sources of this exceptional gain, not only as a matter of information, but also in the hope that some of you may be instrumental in helping to accomplish similar results elsewhere.

In St. Louis we have a relatively new Section. Primarily through the efforts of the members of this Section more than 200 members have been added to the Congress.

In connection with the Western Regional Conference held at Monterey, California, last fall a wide distribution of information concerning the Congress was made throughout the Western States. This action together with the impact of the Conference itself has resulted in obtaining many new members. This was followed by visits of Vice-President Bestor to Oregon, Utah, and Arizona. In each of these States Mr. Bestor succeeded in laying the ground work for a new Section. In each of these three States our membership has more than tripled in the last year.

In Kansas, James L. Bell, Chairman of the Fees and Salaries Committee, distributed

large quantities of application blanks and related information throughout the United States in connection with his fees and salaries questionnaire. This project has produced many new members.

Perhaps the most surprising membership boost has come from Florida where the Florida Society of Professional Land Surveyors has recently enrolled and paid the 1959 Congress dues of its entire membership. Sizable increases have also been made in a majority of the States not mentioned here.

In conclusion, it is a pleasure to award citations for excellence in obtaining new members to William D. Cannell, former Membership Chairman of the St. Louis Section, and Clifford E. Way of Tucson, Arizona.

REPORT OF EXECUTIVE SECRETARY

Mr. President, fellow members, and officers: Briefly, more or less for the record, we should recap a few of the highlights between the 18th Annual Convention of last year and this one, our 19th.

ACSM, through its Cartography Division, was host to foreign visitors after the attendance at the International Cartographic Convention sponsored by Rand McNally and Company at Chicago. We were host to those visitors in Washington between June 15 and 21, 1958.

ACSM's President and Vice President, as you have heard, represented us at the 9th FIG Conference in the Netherlands in August and September of 1958.

ACSM's Western Regional Conference was held at Monterey, California, October 9–11, 1958. That was the first of ACSM's regional conferences and it was a success.

I, as Secretary of the Congress, visited that meeting, visited with the Section officers on the Pacific Coast at that meeting, and also stopped at several of the Sections on the way back. I visited with both the Northern and Southern California Section people, the Utah Section people, and the Oregon Section people at that meeting. We stopped in Sacramento and visited the Northern California Section members there as well as the U. S. Geological Survey members. Then I visited the Colorado Section in Denver and the St. Louis Section.

On the matter of Sections, this has been a year of active growth. A new Section was chartered, the St. Louis Section, at last year's 18th Convention. In July 1958, the Oregon Section was chartered. September 1958 saw the final chartering, after a year's work on the constitution, of the North Carolina Section. December 4 chartered the Utah Section. December 8 chartered the Arizona Section. And at the Board meeting tonight or tomorrow we will see, I am positive, the chartering of the Hawaii Section.

That makes six new sections in a single period between conventions, or a total of 12 sections where we had six since our beginning in 1941.

We have new affiliates: the Kansas Society of Land Surveyors, which affiliated in October; the Central New York Society of Land Surveyors, which affiliated in December; and the East Bay Council of Surveying and Mapping, which was activated actually in September 1953, was actually certified in July 1958, with the charter issued as of September 1953.

As Captain Borden mentioned, the Florida Society of Professional Land Surveyors just enrolled their entire membership.

On the matter of Divisions, Property Surveys Division has been tremendously active as you read in the Journal. The Cartography Division has been quite active and plans further activity.

The Controls Surveys Division, while not being overly active, has been very carefully planning activity, and they are coming out with a pretty strong program for the coming year.

The Instruments Division, of course, is a great question-and-answer department for the Congress and they do a lot of work in that direction. Their main activity centers around the exhibits that we have at these meetings, because the Instruments Division and the professional manufacturers are very much one and the same group of people.

An incident of importance was getting the Boy Scout Manual on merit badges brought up to date by their wonderful cooperation. Someone had written in and called attention to a poor statement or two, and in reply to a letter of urgent protest to

the Boy Scouts of America they, in turn, immediately asked us to cooperate with them, and let us revise the manual.

In the same vein, the very people that wrote the earlier edition of that Boy Scout Manual immediately got in touch with us. I know that the Cartography Division of ACSM has recently edited a pamphlet on cartography, a sort of an over-all covering of the cartographic field as a job, an explanation or introduction to high school people of where to seek employment in the various fields.

I would like to announce a Western meeting which will follow the pattern of the Western meeting that was so successful at Monterey. At that meeting we had a strong turnout of Section chairmen and Section leaders. Enough officers of the Congress were there so that we could hold an executive session, and we authorized next year's regional meeting to be held in Los Angeles, under the sponsorship of the Southern California Section of ACSM.

I would like to comment on the registration at this convention. Last year we had some 1,735, plus or minus. This year we are advised it is somewhat over 2,000.

REPORT OF TELLERS

John M. McAlinden, Chairman of the Tellers' Committee, reported on the results of the election:

President: George C. Bestor
Vice President: Admiral H. Arnold Karo
Directors (for two-year terms)
C. J. Aggeler
William C. Cude
John A. Law
Clifford A. Thorpe, Jr.
James P. Webb

The newly elected president, Mr. Bestor, reported on the activities of the Federation Internationale des Geometres. The Congress passed a motion that the Board of Direction be authorized to appropriate funds for initiation fees, annual dues, etc., for a trial period of three years in this International organization. As additional information is available, reports will be made to the membership through SURVEYING AND MAPPING.

President Bestor closed the meeting with personal remarks to the membership, stating his great interest in the Congress, and expressing his hopes as to the work which can be accomplished in the year ahead.

Social Activities

EDITOR'S NOTE.—As for some years in the past, we are again indebted to Mrs. Frank Borden for this report on the social activities of the 1959 ASP-ACSM Consecutive Meetings.

During the week of scientific meetings of the joint societies the ladies were kept pleasantly occupied with special entertainment. On the opening day they were introduced to the Tamerlane Room of the Shoreham Hotel, set up as their particular rendezvous, with a coffee hour open to a vanguard of fifty seven. There they had the opportunity to meet old friends, and new, and making plans for a week together. Arthur C. Lundahl, speaking informally, explained some of the objectives of the scientific programs, taking as the subject of his remarks "What Your Husband Does."

That evening the ladies were, of course, included at the annual kick-off cocktail party. This was attended by a large and enthusiastic crowd, so large, in fact, that the six hundred tickets provided had to be augmented by cutting some of them in half! Reunions, refreshments, and music made the evening gay.

Tuesday, a luncheon, with fashion show, was held at The Casino Royal. Eighty-eight ladies took advantage of this feature and exclaimed over the profuse display of Hawaiian-inspired finery. This occasion honored wives of past-presidents of ASP, since that organization is celebrating its twenty-fifth anniversary. All presidents' wives, both past and current, were presented with corsages. The sponsors of the show surprised the hard-working chairmen of the entertainment committee with a lovely strand of shell beads.

On Wednesday, the visitors were free to sight-see or shop, with hostesses available to take them to the places they wished to visit. Card tables were set up in the Tamerlane Room for any who wished to remain indoors, though outside activity proved to be more attractive.

Wednesday evening was reserved for the joint dinner of the two societies, and ap-

peared to draw an even larger crowd than previous years. In fact, tables were set up on the stage of the large banquet room to accommodate the overflow. The dinner was excellent, and a delightful program of entertainment followed. A solo dancer executed some fast and intricate stepping, followed by a singing husband-and-wife team who so pleased the diners that the duo was obliged to respond to many encores. Roger Raye, billed as a comedian xylophonist, vastly amused everyone. The xylophone was quite incidental to his zany and hilarious line of patter. Door prizes were drawn as usual, including Rand McNally's much-prized World globe.

Thursday was reserved for Embassy visits. These not only included visits to the headquarters of the United Arab Republic, but also the Chinese Embassy and a surprise tour of the Islamic Center, featuring the very beautiful and oriental Mosque, upon entering which all visitors are obliged to remove their shoes. Upon the return of the busses to the hotel, tea was served in the Tamerlane Room.

Friday, busses took the ladies from their meeting place at the hotel for a tour of the new and very modern studios of N.B.C., where they were introduced to many of the intricacies of telecasting, from the clatter of the news room to the "elephant doors" designed to admit the largest and tallest items which we see reproduced on our home sets. A radio broadcast was seen through soundproof glass, and the ladies were pleased to see Dick Haymes being interviewed. As a climax to this morning of adventure visitors were seated before the large studio stage where they viewed one of the daily color telecasts.

Many of the visitors left the city before the final dance on Friday evening, but there was a large attendance with many couples to enjoy dancing to the tuneful orchestra and to make the evening festive with colorful bouffant dresses.

Great satisfaction was expressed by out-of-town guests with the hospitality and the fine entertainment arranged for their pleasure, and special accolades are due the devoted members of the planning committee for making the week such a memorable success.

Exhibits

The fifth combined ASP-ACSM exhibit was officially opened at 10:00 a.m., March 10, and closed late in the afternoon of March 12, 1959. One hundred eleven exhibit spaces were available, all in one area as in 1958, and these were occupied by 59 commercial exhibits and 21 educational exhibits, with 21 exhibits occuping either two or three exhibit spaces.

The commercial exhibitors taking part in the 1959 ASP-ACSM exhibit were as follows:

Abrams Aerial Survey Corporation, Lansing, Mich.
Abrams Instrument Corporation, Lansing, Mich.
Aero Service Corporation, Philadelphia, Pa.
Air Survey Corporation, Arlington, Va.
Ansco Division, General Aniline & Film Corp., Washington, D. C.
Askania-Werke, A. G. (U. S. Branch), Bethesda, Md.
Baker Surveys Corporation, San Antonio, Tex.
Bausch & Lomb Optical Company, Rochester, N. Y.
Bendix Computer Division of Bendix Aviation Corp., Los Angeles, Calif.
Benson-Lehner Corporation, Los Angeles, Calif.
Berg, Hedstrom & Co., Inc., New York, N. Y.
C. L. Berger & Sons, Inc., Boston, Mass.
Burroughs Corporation, Electro Data Division, Pasadena, Calif.
J. B. Calva and Co., Minneapolis, Minn.
Canadian Applied Research, Ltd., Toronto, Canada
Charles Bruning Company, Mt. Prospect, Ill.
Cooper Trent Incorporated, Washington, D. C.
C. P. Goerz American Optical Co., Long Island, N. Y.
Cubic Corporation, San Diego, Calif.
Data Instruments Division of Telecomputing Corp., North Hollywood, Calif.
Di-Noc Chemical Arts, Inc., Cleveland, Ohio
Direct Reproduction Corporation, Brooklyn, N. Y.
Eastman Kodak Company, Rochester, N. Y.

EDGAR TOBIN AERIAL SURVEYS, San Antonio, Tex.
E. I. DU PONT DE NEMOURS & CO., Wilmington, Del.
EUGENE DIETZGEN CO., Chicago, Ill.
FAIRCHILD AERIAL SURVEYS, INC., Los Angeles, Calif.
FILOTECNICA SALMOIRAGHI, INC., New York, N. Y.
GEO. F. MUTH COMPANY, INC., Washington, D. C.
GEO-OPTIC & PAPER CORPORATION, New York, N. Y.
HASTINGS-RAYDIST, INC., Hampton, Va.
THE INSTRUMENT CORPORATION, Baltimore, Md.
ITEK CORPORATION, Boston Mass.
JACK AMMANN PHOTOGRAMMETRIC ENGINEERS, INC., San Antonio, Tex.
J. G. SALTZMAN, INC., New York, N. Y.
KARGL COMPANY, INC., San Antonio, Tex.
THE KELSH INSTRUMENT CO., INC., Baltimore, Md.
KERN INSTRUMENTS, INC., White Plains, N. Y.
KEUFFEL AND ESSER COMPANY, Hoboken, N. J.
KLIMSCH AND COMPANY, Frankfurt, Germany
LOGETRONICS INCORPORATED, Alexandria, Va.
THE LUFKIN RULE CO., Saginaw, Mich.
MONROE CALCULATING MACHINE CO., INC., Orange, N. J.
MONSEN TYPOGRAPHERS, INC., Chicago, Ill.
OLD DELFT OPTICAL CO., INC., Long Island, N. Y.
O. M. I. CORPORATION OF AMERICA, Alexandria, Va.
OZALID DIVISION, GENERAL ANILINE & FILM CORP., Johnson City, N. Y.
PHOTOGRAMMETRY, INC., Silver Spring, Md.
ROBERTSON PHOTO MECHANIX, INC., Chicago, Ill.
SEISCOR MANUFACTURING CO., Tulsa, Okla.
SOCIETE D'OPTIQUE ET DE MECHANIQUE DE HAUTE PRECISION, Paris, France
TELLUROMETER, INC., Washington, D. C.
UNITECH CORPORATION, Clifton, N. J.
WALLACE & TIERNAN, INC., Belleville, N. J.
WARREN-KNIGHT COMPANY, Philadelphia, Pa.
WATSON ELECTRONICS & ENGINEERING CO., INC., Arlington, Va.
WILD HEERBRUGG INSTRUMENTS, INC., Port Washington, N. Y.
W. & L. E. GURLEY, Troy, N. Y.
ZEISS AEROTOPOGRAPH, Munich, Germany

Educational exhibits were sponsored by the following organizations:

AMERICAN GEOGRAPHICAL SOCIETY, New York, N. Y.
COMMITTEE ON NATIONAL ATLAS OF THE UNITED STATES, National Academy of Science-National Research Council, Washington, D. C.
NATIONAL GEOGRAPHIC SOCIETY, Washington, D. C.
OHIO STATE UNIVERSITY, Institute of Geodesy, Photogrammetry and Cartography, Columbus, Ohio
SPECIAL LIBRARIES ASSOCIATION, Washington, D. C.
DEPARTMENT OF AGRICULTURE,
- U. S. Forest Service, Washington, D. C.
- U. S. Soil Conservation Service, Washington, D. C.

DEPARTMENT OF THE AIR FORCE,
- Aeronautical Chart and Information Center, St. Louis, Mo.
- Air Photographic and Charting Service, Orlando, Fla.
- Air Research and Development Command, Wright Air Development Center, Wright Patterson Air Force Base, Ohio

DEPARTMENT OF THE ARMY,
- Corps of Engineers, Army Map Service, Washington, D. C.
- Corps of Engineers, Engineer Research and Development Laboratories, Fort Belvoir, Va.
- U. S. Army Ordnance, Ballistic Measurements Laboratory, Ballistic Research Laboratories, Aberdeen Proving Ground, Md.

DEPARTMENT OF COMMERCE,
- National Bureau of Standards, Washington, D. C.
- Coast and Geodetic Survey, Washington, D. C.

DEPARTMENT OF THE INTERIOR,
- U. S. Geological Survey, Washington, D. C.

DEPARTMENT OF THE NAVY,
- U. S. Naval Aerial Photographic Experimental Laboratory, Johnsville, Pa.
- U. S. Naval Observatory, Washington, D. C.
- U. S. Naval Photographic Center, Washington, D. C.
- U. S. Naval Photographic Interpretation Center, Washington, D. C.
- U. S. Navy Hydrographic Office, Washington, D. C.

Section Seminar at ACSM 19th Annual Convention

ACSM Sections were well represented at the seminar scheduled early on Wednesday, March 11, 1959, in the ACSM caucus rooms at the Shoreham Hotel in Washington, D. C. The need for closer liaison and contact between the various Sections and the ACSM, and with each other, was indicated in discussion, in the common interest of local and national problems. The inspiring and stimulating session, scheduled for the first time at our annual meeting, was a huge success and well enjoyed by those participating in the lively, worthwhile, and timely discussions.

Those in attendance were: William A. Angeloni, Chairman, Northern California Section; Frank A. Clemens, Chairman, St. Louis Section; Tom Dillon, Chairman, Texas Section; Ira Alexander, representing the Southern California Section; James M. Lawson, representing the Colorado Section; C. E. Bridges, Chairman, Louisiana Section; Victor H. Ghent, Secretary, Property Surveys Division; C. J. Aggeler, ACSM's new director from San Francisco; George C. Bestor, ACSM's new President; Walter S. Dix, Executive Secretary, ACSM; G. W. Herzog, Texas Section (as shown in the photograph). Others present were: A. Phillips Bill, Chairman, Property Surveys Divsion; Professor Ralph M. Berry, Great Lakes Section; and James L. Bell and C. Pfarr from the affiliated Kansas Society of Land Surveyors.

NOTE.—Due to the scheduling of the ACSM Section Seminar early on Wednesday morning and too late for inclusion in either the Preliminary or Final Program, several Section representatives arrived in Washington too late for the Seminar. Their Sections were well represented however, during the convention, by active participation in the Caucus Sessions. Utah Section was represented by its Chairman, Bert K. Steiger. North Carolina Section was represented by its Secretary, W. Thompson Cox. Chairman Kenneth L. Curtis represented the Great Lakes Section. Secretary Ghent, Property Surveys Division, further reports that all Sections and Affiliates were well represented at the Land Surveyors' Annual National Conference sponsored by the ACSM's Property Surveys Division.

Back row, left to right—Angeloni, Clemens, Dillon, Alexander, Lawson, Bridges, and Ghent. *Front Row, left to right*—Aggeler, Bestor, Dix, and Herzog.

Land Subsidence in the San Joaquin Valley as Related to Mapping

By CLIFFORD V. ECKHARDT

U. S. GEOLOGICAL SURVEY

THE SUBJECT of land subsidence is filled with many complex and serious problems. During my experiences with this phenomenon, both as a topographer and as a member of the Inter-Agency Committee on Land Subsidence, I have seen an apparently indifferent attitude toward the subject change to one of grave concern. It has been my privilege to share in this transition as a representative of the Topographic Division, U. S. Geological Survey. It has been satisfying to see the important part that topographic maps play in the study of land subsidence.

My remarks will be directed toward the complexities encountered in mapping subsidence areas and the means by which the problems were resolved. A summary of the historical background, indicating where subsidence occurs and how it is being studied, with some sidelights on preventive measures and the economics of the subject, will be given first to provide a better understanding of the problems related to mapping.

Several subsidence areas, indicated on the drainage map (Figure 1) of the State of California, are notable. The San Jose area in the Santa Clara Valley has subsided about 8 feet by 1954; the Wilmington area of Los Angeles and Long Beach Harbors has settled a maximum of 24 feet; the Sacramento-San Joaquin Delta peat lands, under observation for about 35 years, have subsided during that time a total of 10 feet. The largest area currently under study by the Inter-Agency Committee on Land Subsidence is in the San Joaquin Valley. The full extent of this area is not known, and the map shows only those locations where definite data are available.

Subsidences of the land surface have been occurring in other parts of the United States, as well as in foreign lands. We know of subsiding areas in the Houston-Galveston area of Texas, the Lake Mead area in Nevada-Arizona, The Heart Mountain Division of the Shoshone Irrigation Project in Wyoming, and in Mexico City. The major subsiding areas in oil fields include the Goose Creek and Sour Lake oil fields in Texas, the Wilmington area previously mentioned, and the Lake Maracaibo area in Venezuela. Minor subsidences have been noted at many California fields, such as Signal Hill, Huntington Beach, and Santa Fe Springs.

A SINKING SHIPYARD

This discussion will deal primarily with the San Joaquin Valley area. However, I should like to digress a bit and tell some interesting facts about the Wilmington area. Quadrangle maps in this area were revised in 1948–49 by the U. S. Geological Survey. I was personally frustrated by inability to close planetable traverse lines while sketching 5-foot contours in the "jelly bowl" of the Wilmington oil field. The soggy ground surface of Terminal Island seemed to rest precariously on an unstable foundation, and the ground vibrated in unison with the battery of large diesel compressors working nearby.

Captain C. H. Neel of the Civil Engineer Corps, United States Navy, in a recent issue of *The Military Engineer*,[1] gives a detailed account of the problems the Navy has encountered in this area. The following is largely derived from Capt. Neel's paper.

Presented at the 18th Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 24–26, 1958. Publication authorized by Director, U. S. Geological Survey.

[1] Neel, C. H., "Surface Subsidence at a Naval Shipyard." *The Military Engineer*, Vol. XLIX, No. 332, Nov.–Dec., 1957.

AREAS OF LAND SUBSIDENCE IN CALIFORNIA

FIGURE 1.

The Long Beach Naval Shipyard, the only Navy shipyard within sight of an ocean, is part of the area. It was constructed between 1941 and 1943 and comprises 160 acres of land utilized to provide necessary repair and overhaul services for the fleet. The installation includes four concrete piers about 1,200 feet in length, a wooden pier half that length, several drydocks large enough to accommodate vessels of the cruiser class, and a large drydock over 1,100 feet long by 155 feet wide, with a 48-foot depth of water at the sill. The value of the installation is estimated at $170,000,000. The ground elevation of the shipyard when constructed was about four feet above mean lower low water. As the tide rises as high as 7½ feet, and the installation is sinking at the rate of a foot a year, it is apparent that most of the shipyard is now below high water.

This shipyard overlays the Wilmington

Oil Field, the most productive field in California during the past twenty years. A drilling boom began in 1936, and since that date a total of 2,800 wells have been drilled in the 10-square-mile developed area. Oil is found in five major zones ranging from 2,000 to 7,000 feet below sea level. The strata are warped into a gentle anticline whose sides slope approximately six degrees from the horizontal. The top of the dome lies approximately under the center of subsidence. Because of the flat slopes of the sides of the dome and the lack of a competent load-carrying rock stratum, the dome has little or no structural strength.

Production of this field, as of one year ago, totaled approximately 770,000,000 barrels of oil, over 200,000,000 barrels of water, and 600,000,000 cubic feet of gas. The underground space occupied by these materials is estimated at about 416,000,000 cubic yards, while the volume of subsistence which has occurred directly over the Wilmington Field is about 68,640,000 cubic yards.

When construction of the drydock began in 1941, engineers had difficulty checking elevations of bench marks in the immediate vicinity. Bench marks several miles from the drydock were also unstable. Many theories have been advanced as to the causes, such as compaction, withdrawal of water and oil, dewatering, and tectonic movement caused by earthquakes. After many engineering and geologic studies, the consensus since 1945 is that the subsidence is due to the extraction of fluids.

The subsiding area is shaped like a bowl, with decreasing subsidence from the center. Predictions regarding future subsidence vary widely, with one geologist expecting as much as 72 feet by 1978, under certain conditions, but with the majority predicting about six additional feet of subsidence by 1970 at the center of the bowl.

The strategic location of this area intensifies the damage by flooding and ground water. The inboard end of the drydock has sunk 17 feet, while the outboard end has settled 12 feet. Between 1950 and 1952 dike walls were constructed around the waterfront perimeter of the shipyard. The drydocks and piers also required dike walls around their perimeters.

As the ground surface sinks, the ground water, in effect, rises. Damage has been caused in manholes and around underground utility lines by rising ground water. The large drydock is considered stable from a buoyancy point of view when the average hydrostatic uplift pressure under the bottom is less than 22 pounds per square inch. The present average pressure has built up to about 19.5 pounds per square inch. To maintain stability, sixteen siphons have been placed under the outer perimeter of the dock to lower the ground water table. In 1954 a concrete overlay averaging 7.7 feet in thickness was placed on the floor of the drydock to increase its weight and to level the bottom, which had settled unevenly.

In addition to subsidence there is the problem of horizontal movement. A triangulation station located on top of the Edison Steam Plant had shifted more than four feet by 1949. At the lower portion of the bowl the area is in compression while at the upper half the ground is in tension, with local variations. Horizontal movements have destroyed utility lines, damaged manholes, and overstressed certain members in buildings. Oil-well casings have sheared off underground at various depths. A duct beam has been forced into a manhole in the eastern portion of the area where the ground is in compression. Another beam has been forced out of a manhole in the western portion where the ground is in tension. About a year ago a 90-pound steel rail was pulled apart.

Between 1949 and 1956 the total cost of combatting this subsidence had reached $6,000,000 in the Naval Shipyard alone. Another $22,000,000 has been set aside for constructing higher walls, raising piers, and pumping ground water during the current and next two years.

To prevent further subsidence, experts agree that measures must be taken to restore the underground pressure. This must be accomplished with vast quantities of water. It is estimated that a million barrels of water per day for 5 years will be required

to restore pressures that will halt subsidence. The cost of such an operation is estimated at over $200,000,000.

With approximately 130 operators in the oil field, and the need for repressurization of the field as a unit, it does not appear feasible to obtain voluntary action for these preventative measures. The State legislature is currently considering legislation for countermeasures to halt subsidence in this area permanently.

SUBSIDENCE AND THE WATER TABLE

The San Joaquin Valley subsidence region is divided into four major areas. The largest is identified as the Los Banos-Kettleman City area. This area lies in the west-central part of the valley and is about 90 miles long by 16 miles wide. The area is agricultural, and a large portion is irrigated by ground water pumped from approximately 1,000 irrigation wells. A small area north of the Delta-Mendota Canal is surface irrigated.

The Tulare-Wasco area in the southeastern part of the valley is similar with respect to type of agriculture and irrigation. Much of this area has been irrigated from wells since 1885. In 1950 the Friant-Kern Canal was put in operation and now imports water from the San Joaquin River. The pumping demand in this area has caused water levels to decline substantially since 1905. The greatest overall decline, about 125 feet at Delano and 230 feet at Richgrove, has occurred since 1921.

A definite relation has been established between the change in pressure head, or decline in water table, and the land surface subsidence. In 1953 it was determined by U. S. Geological Survey geologists G. H. Davis, J. F. Poland, and others that 1,200,000 acre-feet of water were pumped in the Los Banos-Kettleman City area. This water table ranges from 10 to 300 feet below the land surface. The upper and lower water-bearing zones are separated by a layer of impervious diatomaceous clay from 20 to 120 feet thick. The lower water-bearing zone varies from 600 to 1,500 feet thick, and from this zone about 80 percent of the pumping is done. During the past twenty years the pressure head in this zone has been drawn down as much as 300 feet.

There has been a substantial recovery in the area east of Delano. This recovery is evidently related to the importation of new surface-water supplies to the area via the Friant-Kern Canal.[2]

The subsidence of which I have been speaking is of a type which might be described as deep subsidence and is caused by conditions below the ground-water level. Another type is called shallow surface subsidence. Both types exist in the San Joaquin area.

BENCH MARKS DOWN THE WELL

Experiments currently are being conducted by applying water to plots of ground never before irrigated. A battery of subsurface bench marks anchored at depths of 25, 50, 75, 100, 200, and 300 feet record the rate of subsidence at these depths. The marks are anchored in concrete at the bottom of the well casings so that no friction exists along the length of the bench mark shaft. Dikes are carefully constructed around the perimeter of the test plot and a constant head of water applied. Graphs of the bench mark elevations plotted against time indicate a general straight-line subsidence rate which begins about the fifth day of operation and continues through several months and after the water is cut off. Another interesting point is that the bench marks started moving in sequence relative to the depths at which they were anchored.

A completely automatic type of bench mark used for deep subsidence studies consists of a stranded cable which is anchored at the bottom of an abandoned 2,000-foot well and threaded over a pulley at the top of the well. The free end of the cable is weighted to keep it taught. As the land surface subsides, or recovers with respect to the bottom of the hole, the cable moves over the pulley, recording the elevation on

[2] Poland, J. F., and Davis, G. H., "Subsidence of the Land Surface in the Tulare-Wasco (Delano) and Los Banos-Kettleman City Area, San Joaquin Valley, California." *Transactions, American Geophysical Union*, Vol. 37, No. 3, pages 287–296, 1956.

the automatic time chart. The arrangement is similar to the present-day water gages with automatic recorders.

COSTS OF LAND SUBSIDENCE

An interesting sidelight on the effects of shallow surface subsidence was reported at a subsidence conference a year or two ago. The government had abandoned an entire airport in the valley because of this type of settlement. Resident personnel were cautioned not to leave their lawn sprinklers running in one spot for more than a few hours. Should one forget this warning, following an all-night watering, a circular section of the lawn might be under two feet of water. It was found necessary to place concrete aprons under downspouts to prevent subsidence around the building. Because airport runways settled and cracked, maintenance became prohibitive.

Ranchers find it necessary to move irrigation ditches every season because ditches sink below the surrounding surface. Discharging water from pumps into a ditch near the pump is avoided, if possible, and the discharge pipe is extended several hundred feet beyond the pump. Many pumps appear to rise out of the ground because the surface area has settled. In such instances ranchers may need to cut several feet off the top of the well casing to lower the pump to the ground surface.

Irrigation wells range in depth from 1,000 to 3,000 feet, and average about 1,500 feet. Installations cost about $15,000, and during the past twenty years there have been about 100 well failures per year, at a replacement cost of $1,500,000.

Many other economic factors can be sited. A major underground gas line failed in several sections. Steel towers supporting electric cables have buckled or tilted at freakish angles because of uneven settlement. The Delta-Mendota Canal has dropped in some sections to such a degree that the maximum carrying capacity has been reduced as much as 900 cubic feet per second. It is necessary to extend the freeboards to prevent the water from flowing over the banks.

Subsidence must be seriously considered in new designs for airports, highways, canals, and utility lines. The Navy is currently studying the problems related to the location of a Naval Air Base with runways several miles in length. The California Highway Department is planning a major west side highway. The Department of Water Resources and the U. S. Bureau of Reclamation are both proposing large canals through the area.

MAPPING TERRAIN THAT WON'T STAY PUT

What are the special problems in topographic mapping caused by this unusual condition? Mapping a subsidence area and publishing the results involve many unusual facets. The rate of subsidence regulates the manner in which the problems are approached. During early studies most of the available data were scattered over a wide area, without sufficient coordination of results or records. Profiles of level lines were plotted and used, but this left much to be desired in the way of good basic data. It was not definitely known which bench marks were stable or how much the unstable ones had moved. It is quite apparent now, that, lacking knowledge of settlement, many level lines were terminated on unstable ground, and many adjustments were made for apparent closure errors that were in reality due to settlement.

As a possible solution to the problem of uncertain vertical control, a proposal has been made to extend a network of precise levels over the entire valley. This has now been accomplished for the second time by the Coast and Geodetic Survey. A complete loop of first-order levels surrounding the valley and anchored to stable ground in both the Coast Range and the Sierra Nevadas is now being established. Several intermediate lines tying across the valley are supplemented with second-order networks of 7½- and 15-minute spacing. The program allows for periodic releveling of selected lines over the known problem areas. Recovery of previous level lines or marks, insofar as practical, will be maintained to permit more complete definition of areas and measurement of instability.

The majority of the new marks established

on the first-order loop line consist of lengths of copper-coated rods driven to refusal. A special type of equipment was used to drive these rods to as much as 100 feet below the surface. Each mark was stamped with the letter "D" and the depth to which it was driven. For instance, D-105 indicates that the rod rests on solid rock 105 feet below the surface.

The inital leveling of the valley network was closely coordinated with topographic mapping and preceded the planetable surveys by only a few months. The preliminary, field-adjusted values were passed on to the topographers as each line was closed. This gave the fieldman values of sufficient accuracy to permit field sketching without delay. The cartographer in "final edit" substituted the adjusted values for publication. Although these rarely disagreed by more than a few hundredth of a foot, the editor was required to work with two values.

In some instances releveling did not reach isolated bench marks. Many marks in the area were established in the early 1900's. Because at that time only a few roads existed, and many of these have since been abandoned, the old bench marks have been difficult to locate. Moreover, elevations correct in 1900, are no longer consistent with the surrounding terrain. For practical mapping purposes such a bench mark is of little value, but it has considerable statistical value and therefore should not be destroyed. It was not economical to run precise spur lines to such points, but it was feasible to establish fourth-order elevations on the marks. This procedure furnished useful elevations for studies of subsidence and for contouring. The cartographer resolved this problem by publishing the elevation given by the fieldman and noting the instability of the bench mark in the control records.

Several quadrangle areas included both stable and unstable terrain. Bench marks located in the unstable areas carried the latest elevations, and a marginal note indicated the date of the latest adjustment. The notes did not explain the bench mark values in the stable areas. Here many marks dated from the early 1900's. In order to distinguish these from those covered by marginal notation, the date of the establishment of that elevation was shown in parentheses beside the mark elevation. Figure 2 illustrates this treatment.

Two quadrangles in the Los Banos-Kettleman City area were completed a year in advance of the coordinated program of mapping. When the adjacent quadrangles were completed, it was apparent that Old Mother Nature had reduced her waistline a substantial amount between the two autumns, and the contours would not join. (Figure 3) Cartographers often encounter such edge problems in suburban areas where man changes the culture quite rapidly and streets will not join. This was a new slant on an old problem. A forced join would destroy statistical data useful for future studies of settlement rates. Furthermore, such a correction might confuse geologists and soil experts. The remedy again involved the date of mapping. Each quadrangle carries a marginal notation indicating that the area is within a subsidence area and a statement of the year of field mapping.

The map user must, of course, be made aware of the conditions which existed at the time of mapping, and he must be further cautioned about the limitations of the map. This was usually accompanied by the marginal notation, and in some cases the area of subsidence was defined with statements such as "the west half," or "southeast portion."

The field engineer obtains as many spot elevations as possible during field sketching. These are generally at road intersections and other definable cultural features. In addition, two elevations are recorded for each irrigation well, one at ground surface beside the pump and the other on the base of the pump. Data are needed to indicate whether the well is on a stable foundation or if it has settled, whether the well has risen, or whether it has settled at a slower rate than the surface. Publishing ground elevations on standard quadrangle maps is a common practice, but showing the second, or pump, elevation is not. It seems best to publish only the ground elevation and make the other data available to those who require them for special studies. Publication of well elevations also requires a change of practice

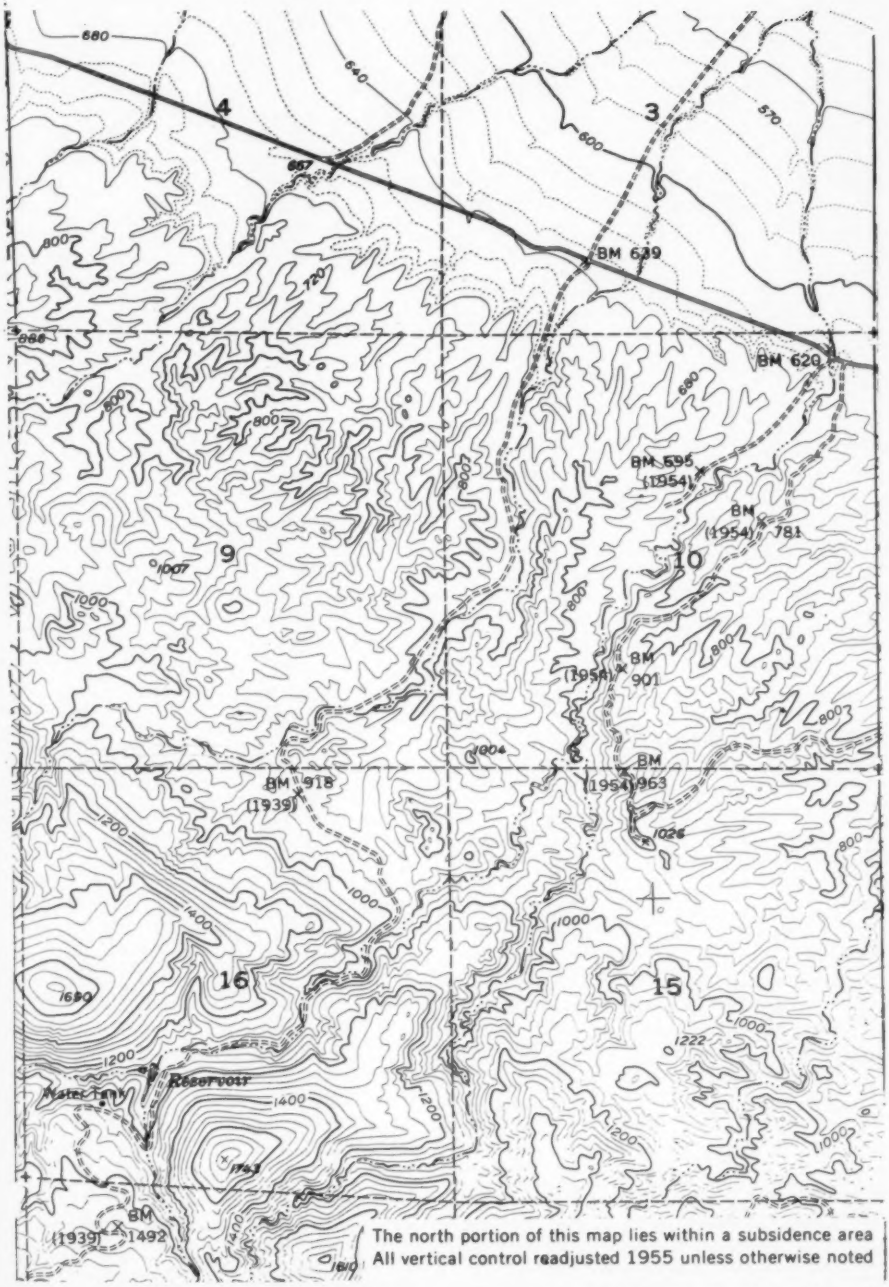

FIGURE 2.—Method of indicating elevations and the year of establishment of each bench mark.

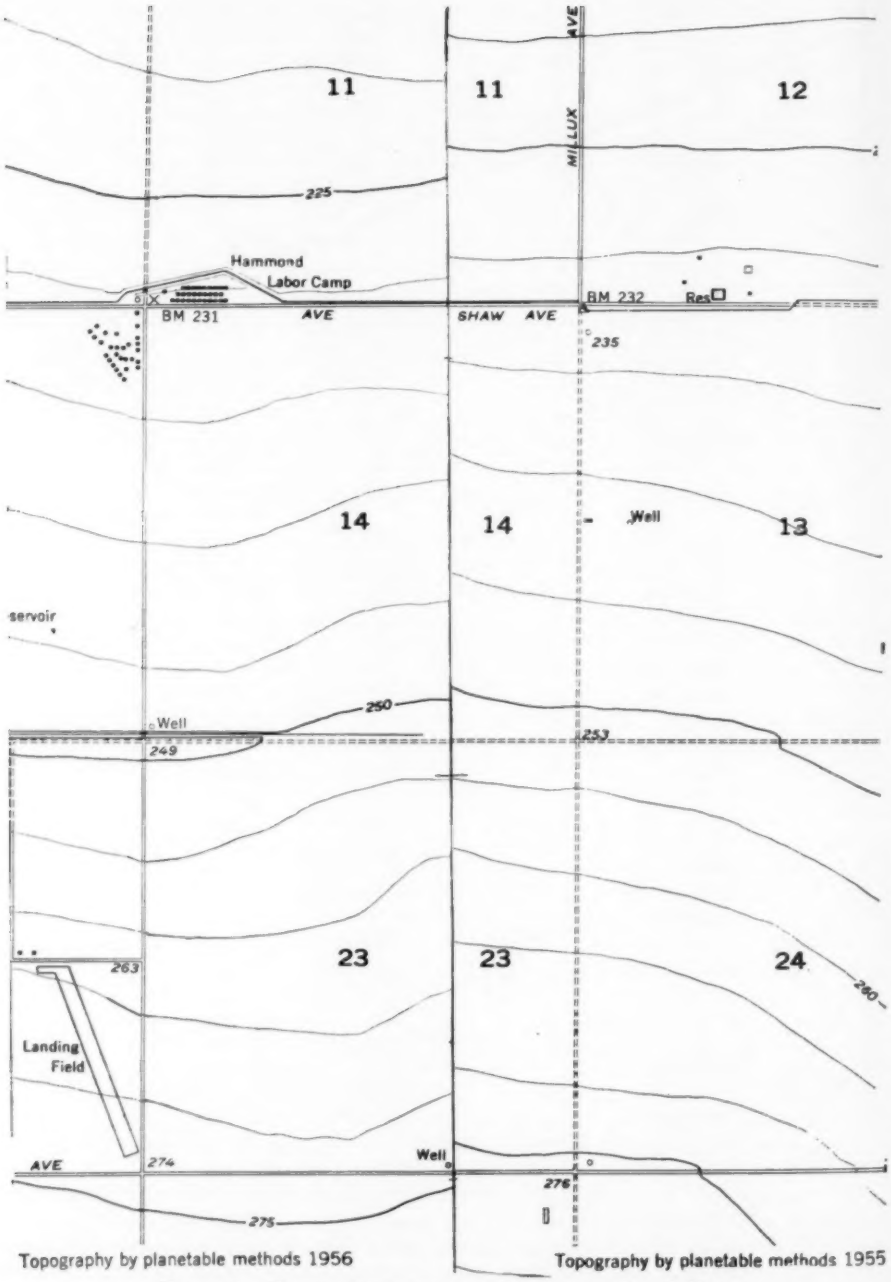

FIGURE 3.—Change of contours created in one year by subsidence.

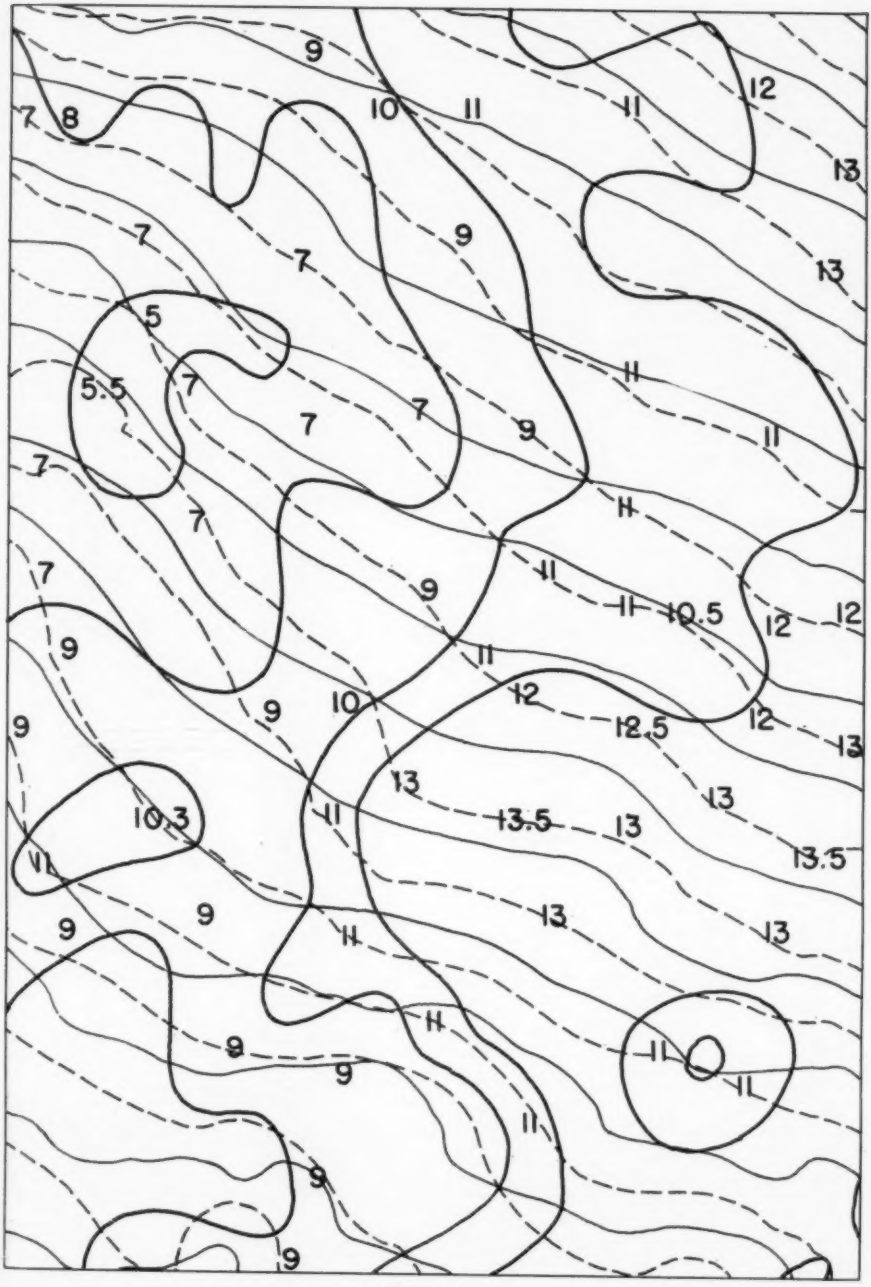
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FIGURE 4.

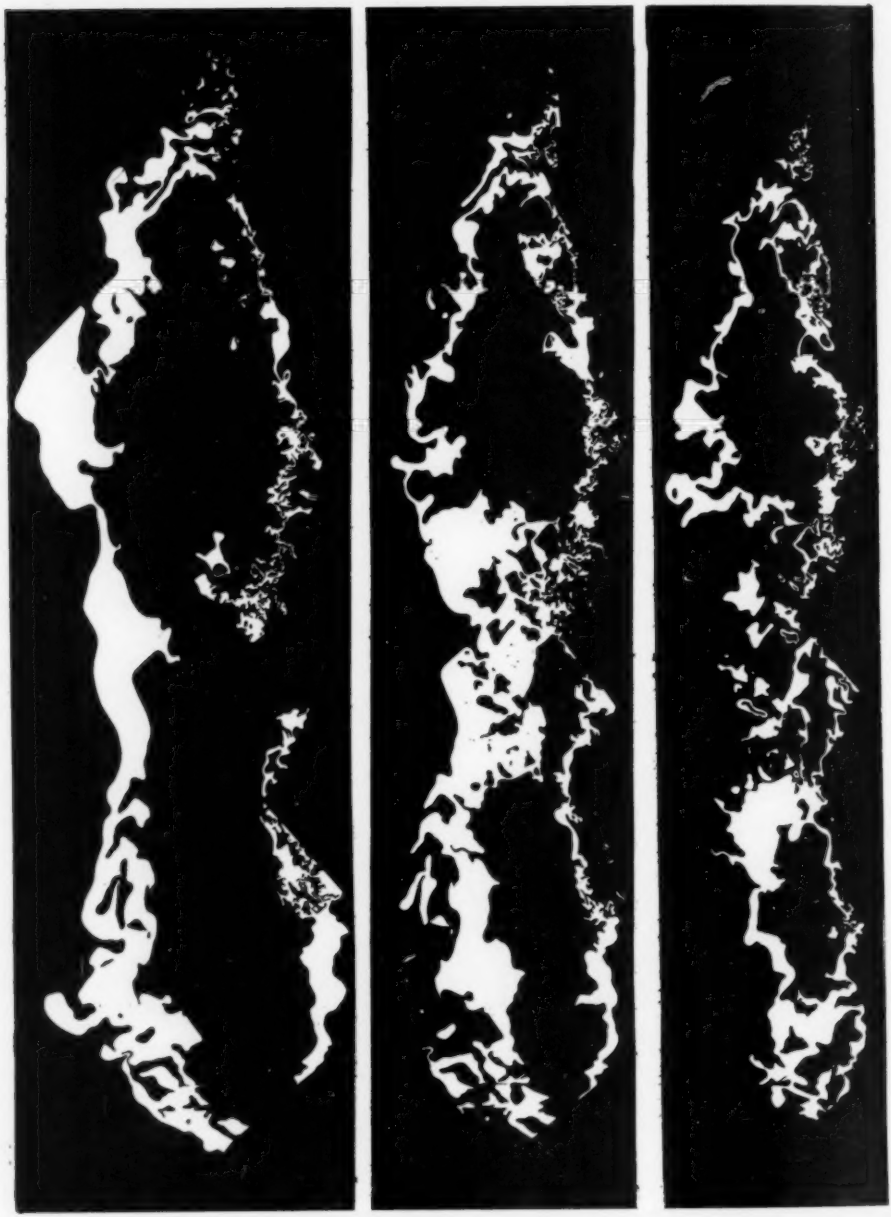

FIGURE 5.—Stripping film plates. Each plate represents two feet of subsidence. Note how each pattern fits the preceding one.

because of the density of wells in the area. A well elevation was often located near a road-intersection elevation, and the common practice of publishing one elevation per mile was not adhered to.

Initial studies of the extent and location of subsidence left much to be desired. The information was obtained from various unrelated sources, and no comprehensive study was possible. Profiles of level lines offered the most conclusive data, but even these fell short of the desired goal. At best they offered data for only a segment of the area, and no one could accurately determine what was happening beyond these lines. The bench marks were scattered, some with elevations of the early 1900's and others with 1954 values, and all contained local adjustments without an overall common datum.

MAPS AND SUBSIDENCE STUDIES

During 1955, when topographic mapping was started, the answer to a complete study of surface settlement seemed close at hand. A picture of the settlement for a period of thirty-five years could be obtained by comparing the original and current topographic maps.

The new medium of white-coated mylar was ideally suited for this study. The old quadrangle of 1:31,680 scale was first enlarged to 1:24,000 and printed in blue on the coated mylar. The new contours were over-printed in red directly from the scribed field sheet. Registry was obtained by adjusting to the coordinates and planimetry of both sheets.

Figure 4 illustrates the method used in compiling the subsidence map. By comparing the red[3] contours with the blue and by interpolating the horizontal difference in terms of vertical values, the total subsidence at any point was obtained. The number of interpolations made along each new contour determined the extent of detail in the map produced. For our purpose a two-foot interval seemed appropriate.

This appears to be a contour map with a two-foot interval and in one respect it is. However, the lines are based on equal subsidence rather than sea level or some other standard datum.

After a study of each quadrangle, the results were reduced five times, assembled in one unit, and printed in composite form on a base map. The composite sheet was edited for continuity and undesirable features were eliminated.

The map was reduced to the required scale and printed on coated mylar for final scribing. These scribed lines were then etched photographically on ten separate plates coated with stripping film. A 2-foot level of subsidence ranging from 0- to 18-feet was peeled from each of these to produce a different plate for each level. In Figure 5 we see the 2–4 foot level, the 4–6 foot level, and the 6–8 foot level. The lines of equal subsidence are translucent and will not print when the plate is used for reproducing the color composite.

Figure 6 shows the results of the study. It has been reduced from a scale of 1:24,000 to 1:250,000, a little over 10 times. A difficult job was accomplished accurately and easily by means of photography and by utilizing the stripping film. Either a color print or a black-and-white print for inclusion in a written report may be reproduced from these negatives.

You will note that new areas of subsidence have been determined by this study. The edges of this chart lack the 0–2 foot level, and in several areas the 4- and 6-foot lines are broken. This has been the basis for additional remapping, and four new quadrangles are scheduled for next year's program.

Remapping the trouble areas could be done at regular intervals. By applying the above processes, an up-to-date pattern of subsidence is obtained, and information relative to both the vertical rate of settlement

[3] Because we could not reproduce this illustration in color, the "red" contours are represented by light dashed lines, the "blue" contours are represented by light solid lines, and the lines of equal total subsidence are shown by heavy solid lines.—EDITOR.

and probable horizontal movements of the troughs are recorded.

It is possible that within the very near future some preventive measures will be developed and placed in practice. Perhaps some of the lines you have seen here today will withdraw from the map, or at least remain where they are now shown.

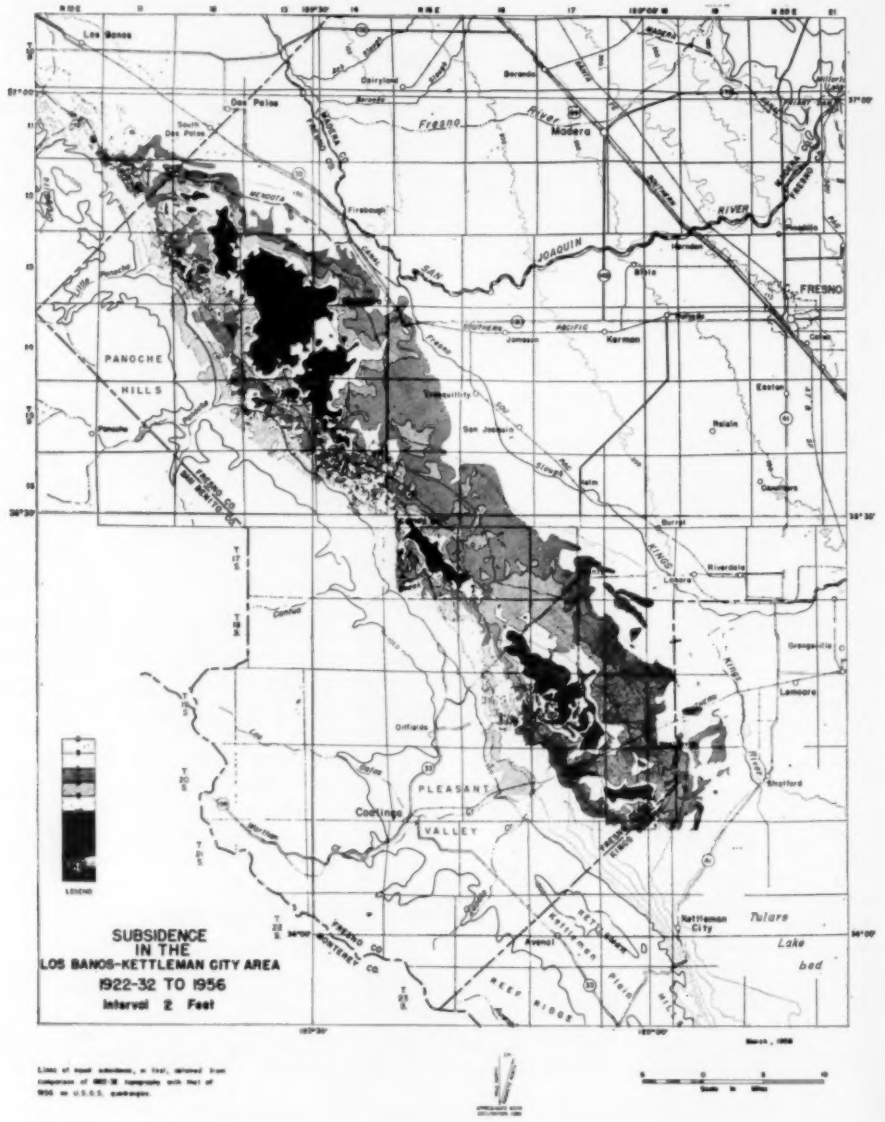

FIGURE 6.

Mineral Surveys

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CONSULTING CIVIL ENGINEER*

SEVERAL distinguishing characteristics of the mineral survey, and certain misconceptions regarding it, seem to indicate that a brief discussion of this subject should prove of general interest to surveyors.

Insofar as this writer is aware, the mineral survey is unique in that it is a *public* survey which is performed by a *private* surveyor. It is true that the mineral surveyor acts in a public capacity, since he is appointed by the Federal Government to execute mineral surveys, and the courts hold that mineral surveys are public surveys. But it is equally true that he is not paid for his services from public funds, but by private interests. This situation, wherein he frequently finds himself called upon to enforce strict requirements against his client's interests, places the mineral surveyor in a unique and sometime unenviable position. In short, he finds himself in the anomalous position of having to deal with his client "at arm's length."

Perhaps the most widespread misconception about mineral surveys is the one wherein it is supposed that the mineral surveyor concerns himself with the mineral character of the claim to be surveyed. This is not the case. The mineral survey is simply a special type of public land survey, and the mineral surveyor is not concerned with questions of geology, mineralization, and the like. He simply makes an accurate boundary survey of the surface of the ground as it has been marked out by the claimant, and performs certain related duties.

Although the above-mentioned considerations are common to both lode and placer surveys, the latter frequently consist almost wholly of written reports by the mineral surveyor and require a minimum of instrument work in the field. This discussion, therefore, will be confined to the surveying of lode claims.

In this connection, it might be well to mention that there is sometimes considerable difference of opinion among experts as to whether a particular claim should be located as a lode or as a placer. A gravel streambed bearing finely-divided, free gold would certainly be located as a placer. The outcropping apex of a well-defined vein of gold-bearing quartz would certainly be located as a lode. But in the case of bedded deposits of mineralized sedimentaries in varying states of consolidation, where the attitude of the "vein" is essentially horizontal, the distinction between lode and placer is not so sharp. From time to time such problems become quite technical, quite important, and quite troublesome; but their complete solution does not lie within the province of the mineral surveyor.

STATUTORY AUTHORITY

The basic Federal statute providing for mineral surveys is contained in Title XXXII, Chapter 6, of the Revised Statutes which became effective on May 10, 1872. Pertinent provisions of this statute include the following:

"A mining claim located after May 10, 1872, . . . may equal, but not exceed 1500 feet in length along the vein or lode; but no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located. No claim shall extend more than 300 feet on each side of the middle of the vein at the surface . . . The end lines of each claim shall be parallel to each other . . . The location must be distinctly marked on the ground so that its boundaries can be readily traced . . ."

"On each claim located after May 10, 1872, and until patent has been issued therefor, not less than $100 worth of labor shall be performed or improvements made during each year . . . But where such claims are held in common, such expenditure may be made on any one claim . . ."

After complying with several fairly simple

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requirements, the claimant may file an application for patent. ". . . together with a plat and field notes of the claim or claims in common, made by or under the direction of the United States Surveyor-General, showing accurately the boundaries of the claim or claims, which shall be distinctly marked by monuments on the ground . . ."

"The claimant at the time of filing this application. . . shall file . . . a certificate of the United States Surveyor-General that $500 worth of labor has been expended or improvements made upon the claim by himself or grantors; that the plat is correct, with such further description by such reference to natural objects or permanent monuments as shall identify the claim, and furnish an accurate description to be incorporated in the patent . . ."

"The Surveyor-General of the United States may appoint in each land district containing mineral lands as many competent surveyors as shall apply for appointment *to survey mining claims.* The expense of the survey of vein or lode claims . . . shall be paid by the applicants, and they shall be at liberty to obtain the same at the most reasonable rates, and they shall also be at liberty to employ any United States Deputy Surveyor to make the Survey."

The Office of Surveyor-General was abolished in 1925, and the duties which the statute ascribes to that office are presently performed by Office Cadastral Engineers and certain administrative employees of The Bureau of Land Management.

The several States may enact and enforce laws governing "the location, manner of recording, amount of work necessary to hold possession of a mining claim . . ."; and even associations of miners may make similar regulations. In issuing patents, however, the Federal Government does not initiate inquiries to determine whether such State laws and miners' regulations have been complied with.

FEDERAL REGULATIONS

The Federal Government is the sole authority with respect to laws and regulations concerning the manner of making the official mineral survey. This includes the land description upon the basis of which the Federal patent is issued. In addition to the basic statutory provisions cited above, competent Federal authorities have promulgated extensive regulations governing the execution of mineral surveys and the manner in which the mineral surveyor's official returns shall be made. For the most part these regulations are embodied in the Manual of Surveying Instructions, 1947, published by the Bureau of Land Management and sold by the Superintendent of Documents at Washington.

The instructions regarding mineral surveys may be roughly grouped under five main headings: (1) The methods and techniques of executing the field work and monumenting the corners; (2) the method of positioning the lode line and adjusting the claim boundaries so that the size and shape of the claim will satisfy the requirements of the statute; (3) the method of surveying and evaluating the improvements; (4) the method of making the official returns of the survey to the Office Cadastral Engineer; and (5) the method of accomplishing the attendant administrative detail.

THE MINERAL SURVEYOR

To secure an appointment as a mineral surveyor, the applicant must pass a written examination, supervised by the Office Cadastral Engineer, calculated to show his ability to perform mineral surveys. He must also post a $5,000 bond assuring faithful performance of his duties as an agent of the United States. Thus, the mineral surveyor is not only honorbound, but is bonded to execute his surveys accurately and in strict conformity with the Federal statutes and regulations.

In making the survey, the mineral surveyor frequently is confronted with complex legal and technical decisions. If the decision is rendered one way, it will be adverse to his client's interest. If it is rendered another way, the decision might offend a strict interpretation of the law. Thus, caught between opposing moral responsibilities, the mineral surveyor has recourse only to his personal and professional integ-

rity in fairly and justly arbitrating these differences in the field.

In this regard, there has arisen in recent years a situation which appears to place an impossible burden upon the conscience of certain mineral surveyors. This is the case wherein a mining corporation with a regularly employed staff of surveyors directs one of its employees to take the examination and secure an appointment, as a mineral surveyor. Subseqent to his appointment, this employee then makes official mineral surveys of the claims of his employer. The question naturally arises as to whether such an employee is in an ethically sound position to aribtrate conflicts of interest between his employer and the United States. As a matter of fact, Circular No. 1785 of the Bureau of Land Management, dealing with lode and placer mining regulations, states: "The employing of claimants, their attorneys, or parties in interest, as assistants in making surveys of mineral claims will not be allowed." In view of the doctrine that the employee acts as the agent of his employer, the propriety of this practice appears to be open to serious question on legal, as well as moral grounds.

INITIATING THE SURVEY

Before the official survey is commenced, the claimant must have performed certain acts upon the basis of which an official order for survey has been issued to the mineral surveyor by the Office Cadastral Engineer. The claimant must have made a valid location based on a valid discovery of ore in place, and the location must be "distinctly marked on the ground so that its boundaries can be readily traced." He must have furnished the Office Cadastral Engineer with certified copies of the location notice or notices. He must have performed the requisite $500 worth of labor and improvements upon each location, or an equivalent amount anywhere on a group of contiguous locations. He must have made an official request for the survey, and informed the Office Cadastral Engineer of the name of the mineral surveyor whom he desires to make the survey.

Upon the basis of the foregoing (and certain other requirements not necessarily pertinent to the actual performance of the survey), the Office Cadastral Engineer issues an official order for survey in which the mineral surveyor selected by the claimant is *directed* to make the survey, and is allowed a specified length of time within which to make his official returns.

During preliminary correspondence prior to the official request for survey, the Office Cadastral Engineer furnishes the claimant with a list of all mineral surveyors competent to perform the survey in question. In doing this, the Office Cadastral Engineer shows no preference whatever, and will not under any circumstances recommend a particular surveyor to the claimant.

Arrangements concerning the mineral surveyor's remuneration are made directly between the claimant and the mineral surveyor, prior to the request for survey. And the mineral surveyor's fees are paid directly to him, not passing through the hands of the government.

THE FIELD WORK

The Manual of Instructions requires that the survey must be an actual survey made on the ground subsequent to the issuance of the official order. It also states that the survey must be made by the mineral surveyor in person, although this regulation is not enforced so long as the survey is made under the direct supervision of the mineral surveyor.

Another regulation (which is sometimes wrongfully evaded in the field) stipulates that no field work done prior to the date of the official order for survey may be incorporated in the official returns. Thus, if the mineral surveyor has previously made an unofficial survey of the location, he may not incorporate these data in his official returns, unless he actually retraces the lines in the field after receipt of the official order for survey.

The primary azimuth must be determined by celestial observation. Other bearings are determined by deflections from the primary azimuth or by means of a solar transit. Measurements of distance must be made with a steel tape to hundredths of a foot;

although, inconsistently, angles need be measured only to the nearest minute.

It is required that lines be run directly between corners where feasible; but because of terrain this method is seldom feasible, and customary traverse methods are employed. Triangulation is permissible only if field conditions demand it.

The required error-of-closure of traverses is quite liberal, being established as not greater than 1:2000. It is amusing to note the attempt which has been made to honor the statute in the case where the regulations state that "the error must not be such as to make the claim exceed the statutory limit." For obvious reasons this regulation is not taken too seriously. (Rather like deciding an issue by the toss of a coin, provided it comes down heads!)

The magnetic deviation must be determined at each corner of the claim. Although this requirement might seem superfluous in these days, it furnishes convenient information for use in making future rough reconnaissance.

Corners must be monumented and marked in a prescribed manner, and trees or other bearing objects, where available, must be referenced to the corners. There is no requirement that lines be blazed.

Topographic and cultural features which might later prove valuable in establishing the locus of the claim must be noted and mapped.

A connection must be made to a corner of the Public Land surveys, if such a corner is available within two miles of the claim. If such a corner is not thus available, and a previously established location monument is not available within two miles, then a new location monument must be established. Requirements as to the site, material, accessories, etc., of a location monument are quite rigid. Its latitude and longitude must be determined by celestial observation. A primary requisite of a location monument is permanence, so that it will perpetuate the precise location of the claims which are "tied" to it.

METHODS EMPLOYED

Although each mineral surveyor develops his own methods and procedures within the law and the regulations, the following might be regarded as fairly typical:

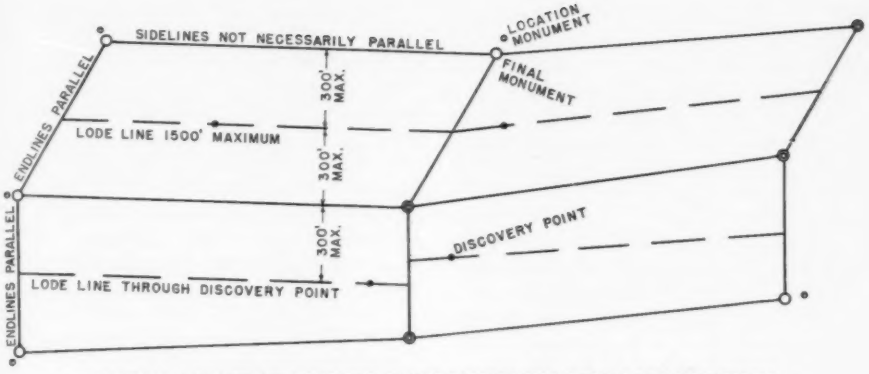
Assuming that the primary azimuth has been determined and a connection has been run between a public survey corner and a corner of the claim, the mineral surveyor customarily proceeds by running a traverse around the boundaries of the claim, tying in each location monument as a point on the traverse or by a short side shot. (It might be noted here that the term "claim" may refer to a single location measuring some 600×1500 feet, or it may refer to a group of contiguous locations.) If the claim is quite large, being composed of a number of contiguous locations, good judgment will indicate the desirability of dividing it into several traverses to facilitate traverse adjustments and the finding of mistakes in the field when traverses do not close to the required 1:2000. Since mines seem to have a preference for rugged mountain terrain, securing a 1:2000 closure is not always as simple as it might appear to the uninitiated.

Upon completion of the field traversing, the notes are set up on traverse sheets in the office, and the error of closure (if within the allowable limit) is distributed by customary methods. The establishment of a system of coordinates is virtually indispensable in making subsequent adjustments of the lines of locations to bring them within the legal requirements as to size and shape.

When coordinates have been derived for each of the corners of the locations as they have been found in the field, the actual positions of the several locations as monumented by the claimant are plotted, and a working drawing of the claim is made.

ADJUSTING THE CLAIMS

It is rare indeed that the mineral surveyor finds that the locations as monumented on the ground will fulfill the requirements of legal claims. In many instances they have been laid out originally by rather crude methods; sometimes even by compass and pacing. Frequently they are oversized, and almost always their end lines are not precisely parallel.



TYPICAL LAYOUT OF A MINING CLAIM COMPRISING FOUR LODE LOCATIONS

Endlines of each location have been made parallel to each other, and oversized claims have been diminished. Each location must have a valid discovery of ore in place.

If these discrepancies may be corrected within the law and regulations without seriously affecting the original intent of the claimant, the necessary adjustments are made forthwith in consultation with the claimant or his agent. But if making the necessary adjustments will have the effect, let us say, of destroying contiguity or of leaving open ground within the group or of excluding some of the improvements, then the mineral surveyor assists the claimant in preparing an amended location notice which will describe the claim as it was intended to be described in the first place. The claimant forwards a certified copy of the amended location notice to the Office Cadastral Engineer and requests an amended order for survey. In this regard the regulations state: "If after having obtained an order for survey the applicant should find that the record of location does not practically describe the location as staked upon the ground, he should . . . obtain an amended order for survey." Upon receipt of the amended order, the mineral surveyor proceeds to adjust the claim lines in accordance therewith.

In adjusting the claim lines the mineral surveyor is governed by several very positive restrictions. *First,* he must not enlarge the claim nor any individual location comprising the claim; the final monumentation must be congruent with or inside the area defined by the original or amended location monuments. He may not move a line which is common to two locations, even though to do so would diminish one location while enlarging another, leaving the net area of the entire claim unchanged. *Second,* he must make the end lines of each location parallel to each other and not more than 1500 feet apart, measured along the presumed course of the lode. *Third,* he must so adjust the sidelines that no point thereon will be more than 300 feet from an aribtrary line known as the lode line, running roughly down the middle of the claim from one end line to the other, and presumably defining the center of the lode or vein. Ordinarily this is equivalent to saying that the sidelines must nowhere be more than 600 feet apart. They do not have to be parallel to each other.

Although not required to do so by law or regulations, the mineral surveyor is frequently able to avoid undesirable ownership patterns by eliminating unnecessary conflicts with adjacent lands, or troublesome slivers and gores.

Having solved the trigonometric problems created by the several restrictions, he arrives on paper at a final position for each of the official corners. He then monuments these corners on the ground in accordance with rigidly prescribed procedure, customarily making use of his temporary field traverse points for this purpose.

THE IMPROVEMENTS

Great significance attaches to the mineral surveyor's responsibility in evaluating the labor and improvements which he finds to have been done upon the claim. The law requires that there shall be at least $500 worth of labor and improvements per location, expended upon the claim by the claimant or his grantor. This precludes the evaluation of improvements done by a former claimant and subsequently abandoned. The former claimant must have passed along his title to the present claimant on the record, in order for such improvements to be included. Furthermore, according to the regulations, only those improvements actually necessary "to facilitate the extraction of the metals" may be allowed in the evaluation.

Frequently, the mineral surveyor must rely heavily upon the integrity of the claimant concerning improvements which it is impossible for him actually to observe. For example, the depth of a diamond drill hole which has caved in may not be measured; yet its value depends upon its depth. Similarly, valuable trenches which have been dug by hand and subsequently obliterated by bulldozer cuts, may not be reproduced for measurement by the mineral surveyor; but they may represent a considerable portion of the value of the improvements. In such cases the mineral surveyor must exercise his best judgment in resolving the issues. Ordinarily he relies upon the presentations of the claimant, but if he has sufficient reason to believe that the claimant is misrepresenting the facts, he should resort to corroborative evidence from workmen or others, either in the form of informal statements or of affidavits. A similar situation exists, especially on old claims, with respect to the question of who actually made the improvements, and when they were made. Considering the fact that the mineral surveyor is dealing with his client in these matters, and remembering his primary responsibility to the United States, some insight may be gained into the delicacy of his position.

The regulations require that the improvements be described with particularity in the official returns. They further require that each improvement must be located on the ground and shown on the plat by course and distance from a corner of the claim or from a point on the lode line. In practice the improvements are customarily located on the ground by transit and stadia from known traverse points, and are related to claim corners by calculation or by graphical means. If there are only a few major improvements on a claim, this phase of the work is not especially arduous. But when there are 40 or 50 small hand trenches and drill holes upon a single location, the surveying of the improvements becomes a considerable undertaking.

Often the mere matter of finding the improvements in the field presents a major problem, and requires constant assistance from claimant. Small hand trenches and inconspicuous drill holes, placed on the ground several years previously, are virtually impossible to discover without assistance in heavily wooded, overgrown, and rugged terrain.

THE LODE LINE

Having plotted all improvements upon his working drawing, the mineral surveyor is ready to establish the lode line. At this point a rather violent conflict arises between actual field conditions and the manner in which the law assumes that such conditions ought to exist. As previously pointed out, the Federal statute states: ". . . no location of a mining claim shall be made until the discovery of the *vein or lode* within the limits of the claim located. No claim shall extend more than 300 feet on each side of the *middle of the vein at the surface* . . ." Such language seems to preclude valid discovery in the form of ore in place at an isolated outcrop or in a minor spur of the main lode. It further seems to presuppose that "the middle" of every vein or lode may be observed "at the surface." The fantasy of such assumptions has been exploded in many court decisions; and the regulations recognize their mythical character in these words: "In the absence of proof to the contrary, the discovery point is held to be the center of the vein at the surface. The course and length of the lode line or *pre-*

sumed course of the vein should be marked upon the plat and specifically described in the field notes." Thus, those responsible for promulgating workable regulations have done their best to stay within the wishful wording of the statute. In general, the courts have upheld them.

So we have a situation whereunder the statute assumes the actual position of the vein to be known prior to discovery, whereas the regulations take a more realistic view by declaring it, in effect, to be where the claimant says it is. Thus, the lode line becomes an arbitrary line on paper, not necessarily having any actual existence in fact upon the ground. And since the mineral surveyor is presumed not to be versed in geology or mineralogy, his task with respect to locating the lode line is simply this: To draw a line on paper in such a way that it passes through the claimant's declared point of discovery, while at the same time not departing more than 300 feet from either sideline. The matter of the validity of the discovery point is later determined by one or more *mineral examiners* who inspect the claims prior to patent and who are versed in geology and mineralogy.

The lode line must not be more than 1500 feet long. It is usually a straight line, although it may be a curved or broken line if there is actual evidence that the vein follows such a course. The claimant's statement is ordinarily accepted as "evidence" by the mineral surveyor. However, a 1906 court decision held that, "there is no warrant in the mining laws for extending, arbitrarily and without any basis of fact therefor, the vein or lode line of a location in an irregular and zigzag manner for the purpose of controlling the length or situation of the exterior lines of the location to suit the convenience, real or imagined, of the locator."

Neither the Federal law nor the regulations require that the claimant place location monuments at the centers of the two end lines of the location. But some State laws do make this requirement, and the mineral surveyor will often find the end centers monumented. In theory these end-center monuments mark "the middle of the vein at the surface," but they are quite meaningless in most cases. The mineral surveyor customarily disregards these monuments in defining the lode line on the plat.

THE OFFICIAL RETURNS

Having completed the field work and the office work up to and including the final working drawing, and having thoroughly discussed these matters with the claimant, the mineral surveyor is ready to prepare his final returns for the Office Cadastral Engineer. This is ordinarily done at the home office, rather than at temporary field headquarters.

The official field notes must be typed in several copies on government forms. An indication of their formality may be gained from a portion of the regulations which states: "No interlineations or erasures are permissible, and no abbreviations or symbols may be used excepting those shown in Section 550, Chapter VII . . . etc."

The official notes include a title page, a general statement which sets forth the manner in which the survey was accomplished, a detailed record of the running of all lines and the monumentation of all corners, a tabulation of areas, a statement setting forth the differences between the positions of the location corners and the official corners, a detailed description and evaluation of all improvements, a statement of miscellaneous pertinent details not included elsewhere, a list of field assistants, and the certificate of the mineral surveyor in which he states "upon honor" that he has "faithfully and correctly executed the survey" and described and evaluated the improvements.

The mineral surveyor is also required to furnish the Office Cadastral Engineer with "a copy of such calculations of areas as are made by double meridian distances and of all triangulation or traverse lines."

The officially prescribed wording of the field notes is rather stereotyped, and leaves little room for the exercise of originality. The certificate is printed on the forms and prohibits modifications. Upon the basis of the mineral surveyor's certification, the Office Cadastral Engineer and other Federal officials certify to the correctness of the survey and evaluation of the improvements.

And upon the basis of these certifications the President of the United States issues a patent to the claim. Thus, the mineral surveyor assumes a burden of responsibility which does not ordinarily attach to private land surveys. Mineral surveyors, as a rule, take these responsibilities seriously and are careful to protect their superiors and the interests of the United States, while at the same time serving their clients.

THE PLAT AND APPROVAL

The regulations state that, along with his official field notes "the mineral surveyor will prepare and file a preliminary plat on tracing cloth . . ." This plat is for the use of the draftsman in the Cadastral Engineer's office, to help him follow the field notes and to prepare the final official plat which becomes a part of the permanent records. It must show the claim in detail, completely dimensioned, with public land corner connections. It must also show all improvements, all conflicts, and those topographic and cultural features which, in the judgment of the mineral surveyor, are necessary to establish unquestionably the locus of the claim. Its scale is usually 1 inch = 200 feet.

Since the preliminary plat itself does not become a part of the permanent land records, the requirement that it be "on tracing cloth" is sometimes relaxed to permit its being filed as a print of a working drawing. It should be noted that the field notes as prepared by the mineral surveyor do become a part of the permanent land records.

Prior to certification and approval of the official returns, the Office Cadastral Engineer has them thoroughly checked for mathematical consistency. Mistakes are sent back to the mineral surveyor for correction. When these checks have been completed, the Office Cadastral Engineer officially notifies the mineral surveyor that his survey is approved. At this point the mineral surveyor's duties terminate, but his legal and professional responsibilities for the quality of his work continue indefinitely. Should it transpire that he has been guilty of gross carelessness, negligence, or misconduct in the performance of the survey, he will be required to correct it at his own expense, failing which, his bondsman will be called upon for restitution. Furthermore, the Department of the Interior has "authority to investigate charges affecting the official actions of mineral surveyors, and will, on sufficient cause shown, suspend or revoke their appointment."

THE LEGALITIES

It might be well to touch lightly upon the maze of legal complexities surrounding the acquisition of fee title to a mining claim, as they relate to the functions of the mineral surveyor. The experienced, private, land surveyor is thoroughly conversant with the degree to which legal questions are interwoven with the technical problems of surveying boundaries. In private boundary surveys, however, most of the legal questions grow out of the common law. Surveys of mining claims, on the other hand, are encompassed not only by the great body of court decisions, but by a superabundance of Federal and State statutes, Federal regulations, administrative decisions, and even by "regulations of miners."

As has been noted, some of the laws require that which it is technically or physically impossible to do, such as determining at the surface the precise position of a lode line discovered by a diamond drill hole several hundred feet deep. In impossibilities of this sort the regulations and long-established custom come to the mineral surveyor's aid.

But in cases where both the law and the regulations require to be done that which offends ordinary common sense and engineering judgment, the mineral surveyor finds himself caught up in a violent conflict between his conscience and his intellect. The frustrations are painful.

A typical example involves two locations with a common line between them. One location is slightly oversized, and the other is correspondingly under-sized, yet they constitute a single claim with a single owner, and their combined size is legal. Under these circumstances the mineral surveyor may not shift the common line, leaving the total area unchanged. To do so would enlarge one location and this is prohibited, even though it would diminish the other.

If the common line happens to be an end line, which is not precisely parallel to the two extreme end lines, it would destroy contiguity if each location were given a separate end line in order not to increase the size of either; but this is prohibited. The alternative is to secure an amended order for survey, which is a time-consuming and inconvenient procedure in most cases and results in the claimant getting the identical land he would have gotten had the common line been shifted slightly.

Similar situations arise in having the lode line pass precisely through the discovery point, when the lode line, as has been mentioned, has no actual existence in fact in the first place.

It is under circumstances of this sort that the mineral surveyor's conscience is sorely tried. It would be so simple and so easy to avoid all of the red tape by moving a small pile of rocks in the field. It would harm no one and would save time and money for both the government and the claimant. But the mineral surveyor must continually remind himself that when the job is done he will have to certify "upon honor" that he has "faithfully and correctly executed the survey . . . in strict conformity with said order, the Manual of Instructions . . . and in the specific manner described in the foregoing field notes." Such an undertaking leaves little room for mental reservations. As a professional practitioner and an agent of the United States there is but one course open to the mineral surveyor. He must do the job as he swears that he did it, and nurse his frustrations at leisure.

Under these conditions the store of knowledge and experience of the proficient mineral surveyor must include a greater-than-average supply of legal understanding, if he is to serve his clients adequately while performing his primary function as an agent of the United States. Although he is specifically prohibited by regulations from performing certain legal chores for the claimant, the mineral surveyor usually finds himself under a veritable barrage of inquiries concerning the legal significance of various acts which the claimant has undertaken, or proposes to undertake. Unless he is prepared to answer a reasonable number of these inquiries with confidence in the field, and without resort to legal consultation, the mineral surveyor falls short of what his client has a right to expect. On the other hand, wrong advice is worse than none. So perhaps the real test of the mineral surveyor, as a professional advisor to his client, lies in his ability to know when to answer questions with legal implications, and when to refer the claimant to his lawyer.

Most mining States have published (usually through their Bureaus of Mines) treatises on the mining laws and regulations, with particular reference to the State in question. It is the duty of the conscientious mineral surveyor to thoroughly familiarize himself with the contents of these publications. Outstanding among them is "Ameri- Mining Law," published as Bullein No. 123 by the California Division of Mines, Ferry Building, San Francisco. By no means confining itself to the State of California, this work was written and compiled by A. H. Ricketts and is published in two volumes. It is a scholarly treatment of the subject, replete with citations, and is highly regarded by both attorneys and engineers.

CONCLUSION

In preparing the foregoing discussion, the writer has attempted to give a condensed outline of the salient features which distinguish the mineral survey, and to give a rough idea of the duties, responsibilities, and modus operandi of the mineral surveyor. In attempting to hold the discussion within the sphere of general interest, it has been necessary to touch lightly upon or to omit entirely a great many pertinent aspects of the problem. Placer surveys have been mentioned only in passing. Problems attendant upon conflicts with adjacent claims, with repurchased "Weeks Law lands," or other special lands have not even been mentioned. Millsites and tunnels and many practical aspects of special conditions met with in field and office, of necessity, have been omitted. The writer has, of course, confined himself to a discussion of his own methods of attacking the problem, leaving

to others the task of explaining their own techniques and procedures, from which he could certainly learn much.

Perhaps it would not be amiss here to insert a word of advice to the layman contemplating the location and eventual patenting of a mining claim. Many problems which the mineral surveyor is called upon to solve at the claimant's expense during his official survey, could be avoided if the claim had been properly located in the first place. The prospective claimant, therefore, should not trust to a pocket compass and a pair of stout legs in laying out his claim, unless unavoidable circumstances compel him to do so. Rather, he should secure competent professional assistance in "getting off to a good start," to the end that he may avoid future costly complications.

The writer hopes that this rather sketchy treatment of an important aspect of the broad field of public land surveying has helped to clarify, rather than to confuse a notably complex subject.

Better Late Than Never

The Evening Star (Washington, D. C.) for Monday, April 13, 1959, included in the column "Vistas in Science" by Thomas R. Henry a 13-inch story under the title "Earth Measurer Aids Map-Makers." This story gave in considerable detail the story of the Tellurometer as applied to the work of the Inter-American Geodetic Survey. This article gives a very good picture of the use of the Tellurometer in the field of mapping and should serve to enlighten a considerable number of laymen as to the usefulness of this relatively new equipment.

However, when the Tellurometer was first exhibited in the Western Hemisphere, at the 1957 ASP–ACSM Consecutive Meetings and Co-Exhibit, certain science writers (not including Mr. Henry, by the way) said, "Ahgh! Same old tripe! Nothing new!" We suspect that they thought the Tellurometer was just an electric heater on a tripod."

—EDITOR

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Report on the 9th Congress of the Federation Internationale des Geometres

By GEORGE C. BESTOR

PRESIDENT, AMERICAN CONGRESS OF SURVEYING AND MAPPING

PRESIDENT W. B. Williams and I had the honor and pleasure to be official observers for ACSM at the Ninth Congress of the International Federation of Surveyors, or, to give it the official title, The Federation Internationale des Geometres, or FIG. Other ACSM members present included Capt. O. S. Reading and Brother B. Austin Barry. The principle meetings of the nine-day Congress were held in the splendid new Mechanical and Marine Engineering Building of the Technical University at Delft, Holland. Social functions and the principal housing of delegates was at Scheveningen, a large seaside resort ten miles from Delft, on the other side of the capital city of The Hague.

FIG was first organized in 1878 but maintained no continous organization until 1930. Two general meetings or Congresses were held between world wars. The Congress was finally reorganized in 1949 and held its first postwar meeting at Lausanne, Switzerland, followed by a meeting in Paris in 1953. The Ninth Congress was held August 27th to September 4th, 1958, and a Tenth Congress is scheduled for 1961, in Vienna. Save up your money; a visit to Vienna that year would be most rewarding.

Day to day operation of FIG is by the permanent secretariat, consisting of a president, secretary-general, and several other officers, and housed at Delft. A new Austrian secretariat will take office prior to 1961. Direction of FIG is by a "Permanent Committee," comparable to our Board of Direction. This group meets yearly and consists of two to five representatives of each member society. Delegations vote as a unit, not as individuals. Membership is by national societies. To date no country has more than one member-society, for only national associations are eligible and in most countries the surveying profession is less divided than here. The various associations differ greatly as to size—not always in direct ratio to the population of the country—in nature, and in strength. Some, in socialist or communist countries, are almost branches of the government; others are as independent and heterogeneous as ACSM. Seventeen societies belonged to FIG at the start of the meeting, all from European nations except the Association of Licensed Surveyors of Israel and the American Institute of Real Estate Appraisers, who are the only representatives of the United States. More of that later. Four new national societies were admitted during the meeting, including groups from Argentina and Liberia. I might mention that of the Communist countries, Czechoslovakia, Poland, Hungary, and Yugoslavia have member societies, and the Poles in particular took quite an active part in proceedings. This year's meeting of the Permanent Committee will take place at Crakow, Poland.

General administration of each Congress is handled by the secretariat, as well as social activities, assemblies, and excursions to points of interest. Most of the nine days were taken up with sessions of the various Technical Commissions which correspond to our Divisions. These Commissions are continuous in their operation, each Congress being the time for reports on interim activities and papers of special interest. Each Commission is fairly autonomous, with a president and secretary, a representative from each member society, plus various interested individuals who work on special projects. To facilitate work, each Commission has its president and secretary from

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the same country, with the result that Commission meetings have a definite national flavor, particularly in the manner of conducting the sessions. German-run Commissions are very scholarly, and the talks tend to be long and profound. The French-run Commissions are a little livelier, but there is the same respect for the expert and the presentation of a paper is a somewhat formal affair. But the one British-run Commission held meetings more like ours, with questions directed at the speakers, occasional arguments, and when speakers were too long-winded they got the bell. I have over-simplified perhaps, for speakers of all nations appeared before each Commission, but it was interesting to note distinct national differences in the manner of handling meetings.

Commission I deals with the compilation of a technical dictionary. Translation of exact meaning of surveying and mapping terms is a matter of prime importance in Europe, and may be of interest to those of our government offices engaged in international surveys. But perhaps I am best able to illustrate the confusion *between* languages, arising from literal translations, by citing the confusion *within* our own English tongue in the usage of a common word: surveyor. If anyone here mentioned to an English friend that he was a surveyor, the Englishman would not be likely to visualize you as sighting through a transit or drawing a map. Only three percent of the members of the Royal Institution of Chartered Surveyors are engaged in land surveying. A slightly higher percentage are in phases of mapping. But 25 percent of the members are "quantity surveyors" or estimators, and something like half are engaged in one form or another of what we would call "appraisals." The fact that the English usage of the word surveyor is reasonably synonymous to the American definition of appraiser seems to be part of the reason why the American Institute of Real Estate Appraisers were the group to join FIG from the U. S. A. Although in some Continental countries surveyors do some appraisal and tax-assessment work, the surveyors outside Britain are generally engaged in work similar to ours, and the subjects under discussion at the Congress were more often closer to our interests than to those of the Appraisers. Delegates from their association took an active part in the work on only one or two Commissions.

Excuse this digression, but, not being a linguist, I am unable to cite words which are difficult to translate from French to German, and so, as an illustration of the need for a technical dictionary, I was forced to use one where meanings change when one moves from England to America. I might mention, in case you fear that the resultant volume will reflect only British translations from French and German, that President Williams is collaborating on this work to insure that special American meanings are recognized.

Commission II deals with the cadastre and with rural reallotment programs. In many Continental countries, the Department of Cadastre includes functions performed by our County Recorders and County Assessors, and in some cases also those of the land surveyor. In Austria, Holland, Germany, France, and Sweden, the survey of a lot or the division of a farm is handled throughout by a public agency. In Belgium, Denmark, and Switzerland, however, the field survey would be done by a private firm. But in all cases the relationship of these various functions is much closer than it is here, and in most countries it is the responsibility of the government agencies to determine not only who owns a piece of property but also the dimensions thereof. From what I could learn in a few conversations, practices in South America, Africa, and Asia are based more on European principles than on ours, though of course methods vary widely and in less developed countries cannot be compared to those of some European nations where comprehensive property records go back for centuries. It was interesting to learn from a South African delegate that the government survey there has established plane coordinates on all property corners, at least in settled areas, and that a deed normally starts with coordinates. I do not know about the rest of the United States, but the

use of coordinates in legal descriptions is barely out of the talking stage in California.

Returning to the word "cadastre"; it seems to have several meanings abroad. Basically it refers to the land registration system. In this sense it means a plan for identification of parcels by name or number, the recording of title transfers and encumbrances, valuation for tax purposes, and boundary identifications and dimensions. Also the term refers to the map, which is the key to the system, and to the field and office staff which prepares these maps and records. Certain other duties of an allied nature have been attached to the bureaus handling the cadastre, such as the reallotment program to be discussed later. By association these too occasionally come under the meaning of the terms cadastre and cadastral. While this may confuse us when trying to determine the limits of these terms in practice, I do not believe it is any more baffling than it must be to a Frenchman who learns that a "geometre" is a surveyor in America, and then as soon as he gets that straight he hears about "market surveys," or "cost surveys," or else he runs into an English surveyor who speaks approximately the same language as the American but normally does quite different work.

If the above generalization is somewhat indefinite, as this and others must be, please remember that President Williams and I were at Delft only nine days, and that is a rather brief span in which to find out "all about surveying" in fifteen or twenty countries. I do not begin to know all I would like to know about surveying in Monterey County, California, after thirteen years of having an office there. As William H. Wattles says in the opening of his book: "And the contrary may be shown." This applies here, but we have tried to bring back some general impressions.

In France the cadastre system originated after their Revolution, and one hears repeatedly a reference to the Recueil Methof of 1811. Primarily the system was for tax purposes. The land, as occupied, was surveyed subsequent to that date, originally by compass and chain, later by plane table, and more recently by photogrammetric methods. The French were early developers of triangulation, and apparently such control was maintained throughout the operation. Much of their work in recent years has been to improve the accuracy of earlier work. The other countries seem to have developed their systems along similar lines in the last century, though less precise means of land registration go way back until we find such records as the Doomsday Books of England in the Twelfth Century.

Rural reallotment, the second major problem coming under Commission II, is very important in almost all Continental nations. While in England land normally passes from father to eldest son, on the Continent the practice is to divide land equally among all children. With rather stable population, and with land holdings being split because of deaths and combined at marriages, the ownership of farmland can become extremely complex. We saw maps which showed single owners holding a dozen scattered fields of one to five acres each, spread over such an area that the farmer spent much of his day in travel. In addition, efficiency was further reduced by the difficulty of using modern farm machinery on tiny plots. Consequently, widespread programs of reallotment have been undertaken. In this the surveyor plays an important part. He first determines the existing boundaries of the holdings, the location of residential sites, and often is responsible for settling the natural boundary of the whole project. In some instances he further determines the existing value of the plots, though in other countries this appraisal function is separate. He then replans the total project area, often realigning roads and irrigation or drainage ditches, which customarily have followed the confused property lines. His final responsibility is to plan and stake out a reorganized layout of properties, so that each owner has one continuous plot equal in value to his several former fields. This is a large order, and naturally one provocative of much discussion.

While the work of Commission II was an interesting example of the different facets of surveying in other countries, I do not con-

sider its work of particular value to American surveyors.

Commission III, however, presented much of interest and importance to us, for it covers surveying instruments and methods, including photogrammetry and cartography. Commission III met almost continuously during the days devoted to technical sessions, whereas most of the other Commissions were able to clear up their agenda in three or four one-hour periods.

There were fifteen national reports and seven special reports submitted to this commission, covering a wide range of subjects and having a general similarity to the topics covered in our meetings or in our journal. For example, there was a Swedish report on extensive use of the geodimeter with average accuracies of 1:500,000. Netherlands, France, and Austria presented papers on new methods for increasing the frequency of geodetic points, and there were several reports on the use of electronic computers for network adjustment, automatic photoplotting, analytic aerotriangulation, etc. Just as earlier in this Convention, there was a report on cadastral surveying by photogrammetry, which was presented by the Austrians who are getting average accuracies of 0.2 foot in their location of property corners by this method. As for American participation in the meetings of Commission III: Captain Reading spoke on his precision survey of the synchrotron at Brookhaven Laboratory, and I was privileged to give a report on the History and Status of Surveying in the United States.

This commission is undoubtedly the greatest source for direct technical benefit, should ACSM decide to affiliate permanently with FIG. I would have liked to have followed all of their discussions last summer, but I was there to learn what I could of the activities of all commissions, so I visited around. One great obstacle is that of language. A considerable majority of the papers were presented in French or German, neither of which I speak, and, while a brief résumé of each talk is given in other languages, it does become tiring to sit through a thirty-minute talk in German to get a three-minute summary. At the general sessions we were all issued walkie-talkies, and, as each speech was given, we could pick up translations by broadcasts from small radio stations at the back of the hall. But that was apparently too complex and expensive to arrange for three or four simultaneous commission meetings. In some cases one could follow the talk from a mimeographed translation, for all talks submitted by the theoretical deadline of three months in advance were translated into the other two working languages. But only part of the speakers observed the deadline, and even those super-linguists, the Dutch, were unable to reproduce some 200 papers in three languages when many were submitted only a week in advance. I think, however, that this problem is recognized and we will find improved conditions in 1961, even though it is hard for Continental professional men, most of whom speak two or more languages well, to realize how language-bound we Americans are. At that, we were far better off than the Argentine delegation. I believe only one or two of their group spoke any of the official languages.

Commission IV covers the subject of Town Planning and Urban Reallotment. The opening paragraph of the report of the president of this commission, Mr. Bernhard J. Collins of London, is a classic: "The concern of every surveyor is with the land. No matter how much the surveyor's role may vary from country to country, always the fundamental consideration is with the land, its configuration, its extent, how it is used, how it is divided up, and what is the property that stands upon it. Within these questions lie an infinite variety of studies. Surveyors are preoccupied with them all, and it is the surveyor's art alone which can give the world a basis from which such studies commence."

European surveyors seem to take more interest in planning than is usual in this country, but I noted the complaint of some surveyors over there that the surveyor was often relegated to the status of a technician to carry out a plan rather than a person to be consulted during the formation thereof. I should mention that Mr. Hunter Moss of the American Institute of Real Estate Ap-

praisers presented an excellent paper to this commission on "Urban Renewal and Rehabilitation in the United States," for the Appraisers showed considerable interest in this commission.

Urban Reallotment is less of a matter of general importance to European surveyors than Rural Reallotment, but it is an integral part of city planning since most of it is in connection with readjustment of street patterns. We saw a good example of it in Rotterdam, where the devasted business area has been rebuilt along ultramodern lines. This was only possible through ordinances permitting extensive shifting of property lines by planners. While I have mental reservations about giving such authority too generally, in Rotterdam it has resulted in a magnificent modern shopping district. It is certainly true that in this country we have been profligate of our natural resources, especially our land, for we have long labored under the mistaken impression that the supply is unlimited, but we are rapidly discovering limits today, and I believe there is much we can learn from our brethren in the older countries on conservation of resources and on resolute rectification of mistakes.

Planning and the work of Commission IV is not of great interest to most American surveyors, and I feel that is unfortunate. I have long believed there was urgent need for surveyors to regain the active position in planning which they once held.

Commission V discusses the problems of the "Junior Surveyor." While it coordinates with Commission VII, Education, it is interested rather in the young graduate. Several years of preprofessional apprenticeship is expected in most European countries, regardless of education, and Commission V is studying means of insuring that young surveyors find this period a broadening experience. As here, too often the recent graduate is assigned routine specialized tasks and reaches professional age with knowledge of only a limited field. This commission is working hard toward a goal of unified accreditation for surveyors so that a man may become qualified to survey in any European country. The president and secretary of Commission V were from Italy, a country which is a considerable exporter of manpower, which could explain their special interest in a universally recognized diploma or professional-level accreditation. Incidentally, it was interesting to me that most of the Italian delegation had the weathered look of practicing surveyors, whereas most of the surveyors from other countries were obviously educators (judging from the number of degrees), administrators, or executives.

Commission VI deals with the personal problems of the surveyor, his professional standing, his salary, and his fee schedule, if in private practice. It was having great difficulty arriving at any helpful approach to these problems, since such wide variations exist in the various countries in terrain, living standards, and conditions of practice. There was even one frustrated suggestion that the commission disband as its task was hopeless, but this was overwhelmingly voted down. So we are not alone in finding these matters difficult. In fact, it was evident throughout the meeting that the problems tend to be similar; only the languages and the details are different. I found most interesting a paper by Sir Alexander Killick which gave a detailed explanation of the status of the surveyor in Great Britain. That they have their problems, too, on what to charge for a property survey is shown by the fact that the booklet entitled "Professional Charges" by the Royal Institution of Chartered Surveyors, contains some fifty pages on what to charge for appraisals, quantity surveys, and other services, but they simply give up when it come to the section entitled "Land Surveying," and say, "Fee by arrangement depending on the intricacy of the work."

Lastly, Commission VII deals with education. They have a diversity of ideas on how this should be handled in the various countries, just as we have here. In England, for instance, at Oxford surveying is taught in the engineering school, but at Cambridge and London University it comes under the department of Estate Management. In Denmark one studies surveying in a five-year course at the Royal Veterinary and Agricultural High School—a term which

means more than here but something less than "university." In general, however, surveying instruction on the Continent seems to be in the technical schools, though there are several independent surveying institutes. Outstanding among these is the International Training Centre for Aerial Survey at Delft, founded and directed by Prof. Schermerhorn, former prime minister of Holland, who was here a year ago and who spoke to our Western Regional Conference at Monterey last October. This is an amazing institution, and instruction is entirely in English, which is becoming more of an international technical language. Generally, as in the United States, the geodetic, topographic, and photogrammetric surveyors in Europe are graduate engineers, whereas the land surveyors have had engineering training or may have studied at an agricultural school, a technical school comparable to our junior colleges, or they may have learned entirely on the job. It was interesting to note that in the Netherlands they now have a five-year course at the Technical University of Delft leading to a degree as geodetic engineer, which is an outgrowth of the three and a half year course at the Agricultural University. There, too, surveying seems to be returning to the engineering fold.

It was before Commission VII that Brother B. Austin Barry presented a summary of the ASCE Task Committee Report and spoke of the problems of surveying education in the U.S.A. I will not comment on his fine talk since much of the material is familiar to you.

From my limited résumé of matters discussed by the Commissions, you can see how similar are the majority of the problems abroad, and the parallel nature of topics discussed at an international meeting of surveyors to those covered here.

There was greater dissimilarity in the general assemblies. The European surveyors take such a congress more seriously than we do a meeting like this. If Mr. Williams and I and the other directors and officers had marched up here to slow music at the opening of this convention, under a canopy of the flags of the 49 States, you would have rightly given us the bird. But they do that sort of thing most impressively over there, they take it quite solemnly, and it does lend importance to the occasion. This seriousness is also noticed in some of the commission meetings. Where I dashed off something a few days before the meeting, and presented my report to Commission III as casually as I would to a group here, I noticed when in Brussels afterwards that the Belgian surveyors had gathered from all over the country to honor the members of their association who had been privileged to speak at Delft. The fact that surveyors in Europe do take themselves and their professional standing very seriously has definite effect on the public attitude toward surveyors. In asking my way one day in The Hague I got into conversation with a retired Lieutenant General of the Netherlands Army, a man who had lived in every area of the globe. He knew of the FIG meeting and referred to it as a "scientific conference." As a courtesy due a visiting "scientist" and "professional man," he went out of his way not only to show me the restaurant I was seeking, but he went inside to see that the headwaiter seated me properly. It would be most shocking for any European surveyor to learn that in the U.S.A. there is doubt in many minds whether surveyors are professional men or technicians, or, as considered by some, high-grade workmen. I recall vividly how, when a rear chainman of seventeen on the Alaska Railroad, the Slovak track workers took off their caps when they spoke to me; though as dirty as they, I was a man of education. To a degree this popular respect for the surveyor still persists over there.

I wish there were time to describe the interesting excursions and social events. I will just mention, to show how social trends over there are following the same pattern as here, that although I was worried about turning out for the official banquet in a tuxedo when the program called for "full dress and decorations," I found more than a third of the men wearing business suits.

The exhibits, however, must be mentioned. The commercial exhibits were quite similar to and about as extensive as those

for this meeting. I noticed one interesting point which perhaps explains in part the strides taken in recent years by instrument manufacturers of West Germany. When the Russians moved into East Germany, certain manufacturers fled westward with only their plans and key personnel. The Communists opened shop rapidly in the existing factories, with pirated designs and using much of the trained personnel. These instruments are now exported extensively to the west, and the East German exhibit was one of the largest. In their rush to produce, they have only moderately improved the older designs, but the West Germans, faced with competition from instruments they designed, manufactured in stolen factories, and with prices determined by political factors rather than costs, have had to extend themselves to the limits of their ingenuity to come out with something new and better. Adversity has its advantages.

The "national exhibits" were demonstrations of surveying and mapping done in the several countries. There were fifteen or sixteen of these. Most were prepared by governmental agencies and showed lavish use of time and materials. Working entirely on his own, with no subsidy from the government and only the booth fee being paid by ACSM, President Williams prepared an extremely creditable U. S. exhibit. He chose as his subject the rectangular system of land surveys employed through all but our Eastern States and a few special areas. Not only did he demonstrate with maps and explain by captions in three languages the development of the General Land Office surveys, but then went on to illustrate current methods of breaking sections down into small plots or subdivisions. It was most interesting, and he deserves a lot of credit.

I probably should mention that, except for a few postage stamps, the only financial outlay to which ACSM went in connection with the FIG meeting was the small booth fee just mentioned. In case anyone is under the impression that we went on a junket at the society's expense, Bill and I did this entirely on our own.

So much for last summer's meeting in Holland. Future relations with FIG are being considered by the Board at its coming meeting.

In evaluating whether this society should spend some eight cents per member to join FIG, one point to consider is the tangible benefits to be derived from participation in the meetings and between-meeting activities. The other countries of the world are not, by any means, retarded scientifically. Outstanding technical advances have come from as widespread spots as Sweden and South Africa in recent years, and many of these advances were first announced at FIG meetings. When it comes to professional and educational matters, we are in a great state of uncertainty in the U. S., and helpful ideas can be obtained by outside contacts. These intangibles, I feel, must be given as great consideration as more tangible gains from advance knowledge of new techical developments. In many ways I think ACSM is being faced with the same kind of decision as must be made by the individual surveyor when asked to join ACSM. When he bases his decision on: "Is joining ACSM going to enable me to earn more money this year?," the answer is "No." And so will our answer be on any such basis. FIG offers no special information services or sure cures for our ills. Just as individual ACSM membership is rewarding about in proportion to the effort one puts into our society, so, I believe, anything we get out of FIG will be in ratio to what we put in.

One special value, in my opinion, lies in the fact that the preparation of reports for the general meeting of the Congress every three to five years gives a great opportunity for self-evaluation. Such programs of internal appraisal are possible at any time: take Bell's extraordinary study of wages and fees in all the States, or Ghent's valued tabulation of licensing laws. But we do not often get around to such studies, unless some dedicated person grabs the ball and carries it. However, knowing that by a specific date we must present status reports on all phases of the surveying and mapping profession should spur us toward coordinated effort toward gathering and evaluating this information on ourselves. I am sure that I

learned more about surveying in the U.S.A., during the preparation of my report to FIG than anyone over there learned from hearing or reading it. Perhaps we would get our money's worth simply from the discipline of periodic and detailed self-analysis.

Now I have covered what we might get out of joining FIG. But the matter goes more deeply. The U.S.A., somewhat against its will, has assumed a position of leadership in the Western World. We must, therefore, give serious consideration to whether or not we have a duty, as the society representing the broadest field of surveying activities in the leading Western nation, to participate in the international activities of our profession. As professional men we are a leader-group in this country, and, as mentioned, our opposite numbers in most foreign countries stand in even higher popular regard as leaders. I do not mean to suggest that we can go in for any elaborate program of do-it-yourself international relations, but I do feel that it is quite possible that we could render a real service to our country by developing good relations with our opposite numbers in the member nations of FIG, by trying to understand their problems and by giving them an opportunity to understand us and ours. The Real Estate Appraisers state that they maintain membership in FIG wholely for that reason, as so little of its activities pertain to their work. They are most anxious that we join also, since they are unable to give FIG much help in the major fields of its work. Proper assessment of our duties in this regard seems to me to be our most important decision. Only if such responsibilities are not clear do I feel we should go back and consider the matter of affiliation with FIG on the basis of what we can profit therefrom.

Thank you. And special thanks to President Williams for his extensive help on this report and to Victor Ghent for getting it reproduced at the last moment.

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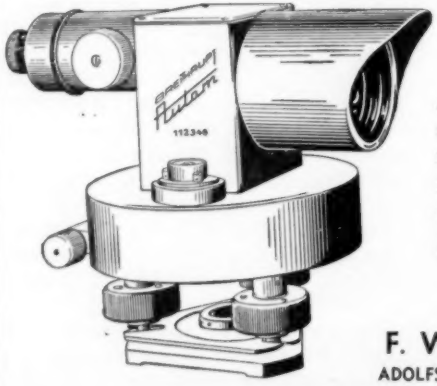

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International Cooperation In Applied Cartography

By DUNCAN FITCHET

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I WAS most disappointed to learn that Dr. Carl M. Mannerfelt could not meet with us today to report on the organizational efforts towards international cooperation in applied cartography. Perhaps more than any other man Dr. Mannerfelt has motivated cartographers to an awareness of such a need.

Call it renaissance, call it revolution, cartography in the Western World has made gigantic progress in the past 15 years. New skills and equipment in field mapping, advanced methods in transforming source materials to map originals, and quality reproduction have brought mapmaking to the assembly line.

With vast areas to map, U. S. Federal mapping agencies have been largely responsible for the great technological achievements and for mass production. But, European countries, traditional strongholds of high quality cartography, have made important advances as well. Cartographers in Britain, France, Germany, and Switzerland, to mention but a few, have done great work in integrating modern efficient methods with a mature approach to the fine points of high quality and good design. With small countries to map and low labor costs, their attention is directed toward fine instrumentation, photographic processes, and special cartographic effects—areas that tend to complement, rather than overlap, map making efforts in the Americas. Europeans are challenged by our mass-production techniques. We respect their quality and cartographic maturity.

In the last 10 years, American agencies, governmental and private, have given quite unsparingly of their know-how. Cartographers from Latin America, Europe, and Asia have come to America to learn. Our competence in mass-production mapping is admired around the world. American cartographers have made major contributions at international meetings. Many of those who have traveled abroad or who may have probed mapping methods in other areas know that one can learn from those with whom one shares. International cooperation is, and of course must be, a two-way street. With the barriers of formality and egoistic agency or national thinking set aside, fruitful accomplishment will result from positive and informal exchanges of opinion. I should like to report on some efforts made in the past three years in this direction.

In 1956 the ESSELTE Conference on Applied Cartography was held in Stockholm. It was sponsored by the largest printer, publisher, and mapmaker in Scandinavia, under the direction of Dr. Mannerfelt and his highly capable staff. Thirty cartographers from ten countries, including five Americans, met together for six days to hear papers and to discuss informally cartographic methods and problems in compilation, drafting, and reproduction.

Revolution, I repeat, *really* is the only word for it! The strides that had been made in preparing map originals already had had a terrific impact upon mapmaking organizations. Recent developments in reproduction techniques, in photolettering machines, and methods such as the stripmask process upset all our conventional thinking about how maps should be made. What was at one time a passive field of artisans engaged in traditional processes has now come alive with advanced thinking that demands a new alertness to the consequences of the impact of new methods upon

Presented at the 19th Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 11–13, 1959.

our productive capacities, our personnel, and the products we make.

It was clearly evident at Stockholm that the best results could be achieved if a small group of active specialists would participate informally in a discussion of recent cartographic developments. The final session at Stockholm dealt with the possibilities of establishing a permanent international organization that would satisfy the wants of the professional cartographers more directly than is now done by existing organizations which concentrate on fields in which the cartographic point of view is only marginal. A resolution was adopted which advocated continuation and extension of international cooperation in applied cartography through an organization that should concenrtate its activities on those aspects of cartography between compilation and the printing press, those areas not already covered by existing organizations. Before any steps could be taken, it was necessary that reaction to this idea be tested in the several countries. The delegates formed a Committee of Six for the purpose of exploring in their own countries the reaction to the need for international cooperation and suggestions as to how it might best be accomplished. The Committee of Six included Dr. Carl Mannerfelt as chairman, Dr. Erwin Gigas of Germany, Dr. D. Chervet of Switzerland, Mr. Bland (and later Brigadier L. J. Harris) of England, Mr. S. de Brommer from France, and the writer.

In October of 1956 an informal meeting of American cartographers was held in Washington to discuss international cooperation and how it might best be achieved. The chiefs or appointed representatives of the major map agencies attended. Those present agreed that international exchange should be encouraged and that it would be preferable if the meetings could continue on the informal basis that made the Stockholm conference such a success. They were unanimous in the belief that no new organization should be formed to accomplish these objectives because there are so many now in existence that relate to the field of cartography in an indirect manner. If a formal international structure were needed, and there was no agreement that this was the case, the majority favored affiliation with an existing organization such as the International Geographical Union. The governmental agencies indicated, however, that they could and would continue to support international cooperation through meetings that might be sponsored by private initiative, such as the Esselte meeting. Attendance would depend upon the quality of the program and participation. Several suggested that the American Congress on Surveying and Mapping serves as an effective medium for cooperation and exchange within North America and that a European federation of national cartographic societies might be established which could at a later date collaborate with the ACSM.

Eight months later, in June 1957, five members of the Committee of Six met again at Lausanne, Switzerland, in conjunction with the Graphic meeting. Reports from the various countries were presented. It was agreed that the Committee of Six should establish further contact with countries not presently covered by the existing committee. Each country was urged to establish its own national organization so that an international committee might be formed with representatives from each country. Further contact with academic, commercial, and governmental cartographers was urged to study more fully the interest in international cooperation on a wider basis.

In February 1958, the Eighth Consultation on Cartography of PAIGH was held in Havana. Representatives of cartographic organizations in the American republics met together to discuss their problems. On that occasion I had the opportunity to discuss international cooperation with officials of a number of Latin American map agencies. The enthusiasm for more active exchange on a wider base was spontaneous, but spokesmen feared that their participation might be limited by financial considerations.

Just two years after the initial Esselte Conference, Rand McNally sponsored the Second International Conference on Applied Cartography in Chicago in June 1958, for the purpose of sustaining the initiative

established at Stockholm and to review and broaden the areas of discussion. The Cartographic Division of the ACSM greatly assisted the June meeting by arranging a week of visitations in Washington for the foreign delegates.

It would be inappropriate for me to comment upon the success of our Chicago meeting. I feel free to speak only of the purposes behind the meeting and of the outstanding work of those who participated. In an effort to pattern our conference along the lines of the Stockholm meeting, whereby maximum exchange would be guaranteed, we had to restrict attendance to fifty delegates. Academic, free-lance, commercial, and governmental cartographers from twelve countries presented papers and materials. Nineteen business sessions were held in six days, and nearly 100 papers were presented and discussed on subjects relating to design, compilation, drafting, relief, and reproduction.

The Cartographic Division of the ACSM was well represented at Chicago. As chairman of that conference, I am at a loss for words to express adequately my sincere appreciation for the contributions made by the ACSM members.

The final session of the Chicago conference also dealt with a discussion of means for perpetuating international exchange. The Committee of Six presented the results of their efforts. Great interest was reported, but there were many different approaches to the "form of organization" and the areas of cartography to be included in its work. Some countries felt that a completely independent organization should be set up; some believed that a cartographic section should be developed within an existing world organization; and others felt that cooperation could best be stimulated by unofficial meetings of specialists, similar to the first two conferences. A substantial number of delegates at Chicago spoke in favor of continuing with informal conferences of specialists on a pay-as-you-go basis with provision for additional groups of observers.

The Committee of Six reported also that it found that its efforts to stimulate the formation of national cartographic committees or societies had good results. It seemed desirable, therefore, to invite delegates from these organizations, such as our ACSM, to an organizational meeting in Europe.

The resolution adopted at Chicago called for the Committee of Six to continue functioning until such a European meeting could be arranged. Dr. Gigas of Germany, as Secretary, was asked to plan a meeting of the Committee of Six with one representative of each of the national cartographic societies or committees, including a representative of the ACSM, for the purpose of deciding upon future action.

Last November, this meeting was held in Mainz, Germany, near Frankfurt. It was sponsored by the Deutsche Gesellschaft für Kartographie, the German national cartographic society, with Dr. Theodor Siewke as chairman. Representatives from ten countries attended, including France, Belgium, the Netherlands, Germany, Switzerland, Austria, Great Britain, Finland, Sweden, and the United States.

I had the pleasure of attending the Mainz Conference as a member of the Committee of Six and as a representative of ACSM. Nice letters from President Williams, President-elect George Bestor, and Walter Dix, Executive Secretary, gave valuable guidance during the discussions.

As I have mentioned above, much progress has been made in establishing national societies or committees within the countries of Europe. Since 1956, national organizations have been set up in France, Switzerland, the Netherlands, Belgium, Spain, and Finland. Existing societies in other countries, represented at Mainz, joined in expressing their desire to cooperate in the exchange of ideas in technical cartography. There was again some disagreement regarding the form of organization and the scope of activity. Therefore, a summary of the specific views of the delegates at Mainz might be of interest.

The Deutsche Gesellschaft für Kartographie favors a federation of national cartographic societies. Where they do not exist, countries should appoint committees to act in their place. The formation of a European cartographic federation is an impor-

tant first step. Dr. Siewke in summing up for the German Society felt that the new organization or federation should be self-supporting and independent of the great unions of geography and geodesy.

The French Committee has favored affiliation with an existing world organization such as the International Geographical Union or the UN Cartographic Office program.

Great Britain shares the view that cartographers should keep in close touch with geographers and therefore assist in strengthening the IGU. They agree that a vehicle for international exchange should be created but that formation of national committees or societies must come first. Brigadier Harris, speaking for the Royal Society, gave the official view of the British government and explained that organization's desire to have all cartographers of the world working together with the academic geographers under the IGU in a cartographic section. Should the IGU fail to represent the requirements of the cartographers satisfactorily, he explained, then there are various ways to influence the IGU in this regard. Unless this plan were considered as the first step, the British could not assure their participation in any subsequent meeting.

The Dutch also spoke in favor of affiliation with the IGU, for within their country applied cartographers operate as a branch of the Royal Dutch Geographic Society.

Professor Imhof explained that the biggest question in Switzerland is whether to establish a society strictly for cartography or whether to join an existing geographical group. He expressed his personal desire for independence of existing international organizations and his belief that informal exchange between national societies presents the best medium for progress.

The Belgians did not favor affiliation with the IGU but instead proposed that a new organization be formed within Europe by a federation of national societies and that later exchange between the European federation and other regional cartographic groups and other bodies related to cartography could take place.

Finland spoke for a new world-wide cartographic organization independent of existing geographic or geodetic societies.

Dr. Mannerfelt, speaking for the Swedish Cartographic Society, cautioned against confusion of purpose with existing world organizations for sciences which have only a marginal cartographic interest to the extent that the subject complements their basic purposes. The Swedes believe that informal meetings of limited numbers of specialists are more worthwhile than great international conferences.

Austria favored ultimate association with the IGU provided that cartography is granted certain independence as a field in itself.

In describing the American position, I explained the solidarity against the formation of a brand-new worldwide cartographic organization. The majority view in America continues to favor exchange without an international organizational superstructure. Some, however, favor affiliation with the IGU or other semirelated international bodies.

Much of the discussion at Mainz dealt with the scope of the field of cartography so that any further action would be confined within an agreeable field of responsibility. The majority of the delegates openly expressed their understanding and agreement of the objectives and purposes of international cooperation within the definition that was developed. It was agreed that an international organization, formal or informal, is needed to deal with those matters central to *professional* cartography comprising the graphic processes concerned with the scaled representation of the information about the earth's surface by symbols and colors. This information, of course, is contributed partly by related sciences such as surveying and photogrammetry, geodesy, and geography, and partly from statistics and other sources. It is not the function of cartography to collect such information but rather to interpret it in graphic language and to give it cartographic expression. It is to provide a platform for those persons actively engaged in the production of map originals, both in editorial preparation and technical execution. In many definitions, both surveying

and printing are included as cartography. Majority opinion, however, is that the term "cartography" should apply to those operations between original survey and the printing press.

In the resolutions adopted at the Mainz Conference, the delegates agreed that it would be unwise to form a complete new and independent international organization. Membership in an existing international body would be satisfactory provided complete autonomy is assured. Although the Committee of Six asked that it be dissolved in favor of a more official committee representing more participating nations, the Conference requested that it continue to function.

An Interim Coordinating Committee of three was appointed, composed of Dr. Gigas of Germany, Dr. Mannerfelt of Sweden, and Professor Imhof of Switzerland as chairman. Their assignment was to consult with officials of the International Geographical Union regarding possible affiliation and to arrange a meeting in Europe in June of 1959 of delegates from those countries which were invited to or which attended the Mainz meeting. At that time action will be taken upon the recommendations of the three-man committee.

Finally, it was resolved that those in attendance at Mainz should request their national organizations to appoint a delegate to attend the June meeting with full power to decide in favor or against affiliation with the IGU and subsequently to prepare an application for membership in the IGU or to take action towards establishment of a third informal international cartographic conference.

With these two remaining alternatives for the form of international cooperation, that is, to continue with informal conferences arranged between the national cartographic societies, or to affiliate with an existing international body, I should like to expand these approaches rather briefly. Many delegates favored the American recommendation that formal affiliation with another organization be delayed. It was the American viewpoint that no international superstructure would be necessary to effect international exchange but that a committee composed of representatives from national committees or societies could on its own initiative arrange subsequent meetings without the cost of international superstructure. Perhaps on a quota system national representatives could work through their national societies to select delegates for conferences and approve lists of observers for each meeting. Each country could prepare and translate its papers in advance. Transportation and conference expenses could be on a pay-as-you-go basis. National organizations could reprint the important papers in their own periodicals for general consumption at a later date. Perhaps then at a subsequent time an independent cartographic society in a form acceptable to all might result. Perhaps then, with a record of accomplishment and a pattern of operation, the cartographic group might seek association with an existing international body. On the negative side, however, we must understand that national associations are themselves instituted for different purposes and that it is difficult to find an entirely logical form for their common activities. For example, the French Committee is devoted primarily to cartographic techniques and expression. The Swedish Cartographic Society is concerned with cartography in its fullest expression from surveying to printing.

With respect to the second alternative, there are many who feel that professional cartographers would not feel at home within existing organizations such as the International Society for Photogrammetry, the Federation Nationale des Geometres, Union Geodesique and Geophysique Nationale, or the International Geographical Union. Professor Ahlmann, President of the International Geographical Union, has favored a cartographic section. He feels that cartography is so intimately connected with geography that a cartographic section within the IGU would prove beneficial to the interests of both sciences. He has said, however, that a section within the IGU could hardly deal with cartographic techniques but rather with geographic cartography and photo geography. A recommendation by the Executive Committee of the IGU for

the establishment of a section dealing with these areas will be placed before the Geographical Congress in Stockholm in 1960. Unlike the purely scientific organizations such as the IGU and those like the UN that deal primarily with work of governments, a professional cartographic organization must include members of official agencies, private firms, academic cartographers, and professional freelance people. What we are seeking is cooperation between individuals and mapmaking organizations drawn from the entire field of cartography.

When in Zurich in November 1958, I discussed this problem with Professor Hans Boesch, Secretary-General of the IGU. He feels that cooperation within the cartographic field is more essential now than ever before and favors the establishment of a special commission for cartography within the IGU. This official committee, composed of a President and five members for a four-year period, could work independently of the IGU, and the membership could later be increased as found suitable by the addition of corresponding members. Informal conferences such as the Esselte and Rand McNally meetings could be arranged by the chairman of the Commission. The cartographers themselves can propose the Chairman and the commission members. Even if the commission is responsible to the IGU Secretariat, and from some points of view this may be considered an advantage, the chairman can arrange meetings on any problem in cartography. The cartographers would have the benefit of operating within an approved international body bearing the endorsement of the ICSU (International Committee of Scientific Unions) and the UNESCO. It is possible that small financial support can be obtained from the IGU. Since the ICSU contributes only to purely scientific research, and as cartography is concerned with technical and practical matters financial aid would be slight.

On the other hand, the critics of such an affiliation feel that little direct benefit will accrue to the cartographers because the interests of the academic cartographer are not the same as those of the professional cartographer. In America for example these cartographers are members of very separate groups, the Association of American Geographers and the ACSM. Concern also has been expressed that since the IGU draws active participants from all its member nations, it is quite probable that meetings arranged by a special Commission on Cartography would have a very large number of participants and observers.

The coordinating committee appointed at Mainz met in Zurich three or four weeks ago to discuss the subject further with Professor Boesch. Its recommendation to the cartographic group that will meet again in June will be that an informal, more representative committee be established. It will recommend that a Chairman and ordinary members be chosen to function until a definite election can take place at the IGU Congress in Stockholm in 1960. Dr. Mannerfelt reports that his meeting in Zurich with the Secretary-Treasurer of the IGU revealed "such exciting prospects that one now can say that almost all of the disadvantages which previously existed regarding cooperation with the IGU now seem to be overcome." As a result, the special coordinating committee will recommend that the cartographers associate with the IGU as a special Commission on Cartography. Dr. Mannerfelt believes that it will be possible without great organizational procedure to obtain complete independence and full consideration of all the main points of view expressed by the 27 delegates who attended the planning meeting at Mainz.

Of course, if the cartographers are not satisfied with the form of organization they experience, it is also possible to leave the IGU and operate independently. The success of a proposed Commission on Cartography will depend less on IGU support and efforts than it will upon the activity of the Commission's participants. It will be the Chairman and the regular committee members alone who will be responsible for the Commission's policy and activities in international cartographic cooperation.

Therefore, it rests with us to resolve our thinking in favor of affiliation with the IGU or informal relationship between cartographers of different lands. The American

Congress on Surveying and Mapping will be asked to have a representative at the forthcoming meeting to be held in June 1959, in Paris, who will be able to speak for this organization. I sincerely believe that the delegates from the different countries that attend this meeting will be able to develop a stimulating plan for perpetuating international cooperation among professional cartographers about the world.

"Plan For Learning"

United States Steel Corporation's 16 mm sound motion picture in color, "Plan For Learning," was shown to a group of approximately 80 representatives of the press, the National Education Association, and other organizations following a luncheon at the Carlton Hotel in Washington, D. C., April 15, 1959. The film had its "official premier" at a meeting of State Presidents of the American Association of School Administrators in St. Louis, Mo., May 1, 1959.

"Plan For Learning" tells the story of fictional "Elmsville," taking the viewer through the first meeting with the small citizens' committee in the Superintendent's office, through the town meetings, through the planning stages with the architect, and ending with the new school perfectly tailored to the needs of modern education as well as the characteristics of the site.

The film was produced, using professional actors in the key roles, with the cooperation of representatives of the American Association of School Administrators and the American Institute of Architects. It requires 27 minutes for showing and should be well worth exhibiting to any group involved in trying to help untangle the problem of providing necessary classrooms in many localities throughout the country.

"Plan For Learning" may be secured on a loan basis for exhibition to interested groups by communicating with United States Steel Corporation, Film Distribution Center, 525 William Penn Place, Pittsburgh 30, Pa.

By way of explanation for the inclusion of this item in SURVEYING AND MAPPING, we believe that since the days of the one-room log or frame schoolhouse no school building has ever been built without there being a surveyor involved in the project somewhere along the path from planning to dedication.

—EDITOR

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Classification and Standards of Accuracy of Geodetic Control Surveys*

INTRODUCTION

The Government of the United States makes nationwide surveys, maps and charts of various kinds. These are necessary to provide basic information for the conduct of public business at all levels of government, for planning and carrying out National and local projects, and programs for the best use and development of natural resources, and for National defense. Principal types of maps are topographic, geologic, soil, and those which show timber and other natural vegetation. Principal charts are nautical and aeronautical. All maps and charts are originally based on surveys, and in addition the survey category includes surveys of the public lands (cadastral surveys), and hydrologic and meteorological surveys. State and local governments regularly cooperate in various parts of the total surveying and mapping program, and business and industry not only profit from survey results but in many instances make their own surveys.

In making surveys and maps of large areas, whether financed by public authority or by private corporations or individuals, it is first necessary to establish a framework of control survey positions. This not only insures that the detailed local surveys necessary for the construction of any map or chart sheet will be done most economically, but also that such sheets, when completed, will join properly along their borders. Surveys of large areas must take into account the curvature of the earth. For small areas, such as a farm, a city lot or even a small city, the curvature may be ignored. Larger areas must be surveyed by methods which recognize that the earth is a flattened sphere, or spheroid. Such surveys are called geodetic. They are executed with high precision, and are the framework of surveys to control National mapping and charting operations as well as large engineering projects. Geodetic surveys and control surveys are terms which are used almost synonymously.

Control surveys are of two classes, horizontal and vertical. Horizontal control surveys establish latitude and longitude positions and provide the basis for rectangular coordinates, including State coordinate systems. Vertical control surveys determine elevations referred to mean sea level.

Horizontal control surveys are carried out by triangulation (a procedure of determining the lengths of the sides of a system of joined or overlapping triangles by measuring occasional side lengths upon the ground and computing the others from angles measured at the vertices), and by transit and tape traverses. The lengths of triangle sides or of traverse distances may also be measured by electronic instruments, which measure the travel of time of a beam of light or radio pulse. Recent progress in the development of such instruments indicates increasing use of such procedures.

Vertical control surveys are carried on by precise leveling. The instruments used are of higher precision than those used in ordinary spirit leveling for surveys of small areas, and the computations and final adjustment refer the resultant elevations to mean sea level.

The accompanying tables group control surveys into orders and classes, in accordance with certain standards of accuracy. The recommended spacing or distance between survey stations is also indicated. These standards are primarily intended for guidance of Federal agencies in performing and classifying their control survey operations. They should also be useful to State and local governments, and to private corporations and individuals.

These classifications were prepared by the Bureau of the Budget in cooperation with the Federal agencies concerned in making control surveys or in utilizing their results. These include the Coast and Geodetic Survey, Department of Commerce; the Geological Survey and the Bureau of Land Management, Department of the Interior; The Forest Service and the Soil Conservation Service, Department of Agriculture; the Army, the Navy and the Air Force, Department of Defense. After being prepared by representatives of the Federal agencies, the standards of accuracy were referred to the American Society of Civil Engineers and to the American Congress on Surveying and Mapping for review and comment. The opinions of other organizations and individuals were also requested and received. After consideration of all comments the original draft was revised in this, its present form.

* Approved by the Bureau of the Budget and referred to in Bureau of the Budget Circular A-16, Exhibit C, dated Oct. 10, 1958.

BASIC GEODETIC PROGRAM

A basic program for establishing geodetic control described in these classifications is in progress to provide adequate spacing as well as sufficient strength and accuracy to meet the needs and satisfy the requirements of engineers and scientists engaged in the development and conservation of the resources of the United States.

The horizontal control network of the United States consists of a framework of arcs of triangulation extending north to south and east to west and crisscrossing each other at intervals of about 60 miles. The areas between the arcs are subdivided with networks of single triangles, supplemental arcs, or traverses.

The basic program for the ultimate development of the vertical control net of the United States is to form loops of first-order lines spaced at 60-mile intervals, divided by lines of second-order leveling spaced at 25– to 35–mile intervals. In areas where the interest and need for leveling require closer spacing the first-order spacing may be less than 60 miles. In areas where conditions require it, a spacing of second-order lines at 6-mile intervals may be established. The reference datum shall be mean sea level.

HORIZONTAL CONTROL

Generally, the density of permanently marked control points should be in direct ratio to land values. In metropolitan areas and along interstate highway systems a spacing at 1 or 2 mile intervals may be required and in rural areas of high land value a spacing of 3 to 4 miles may be desirable. Although wider spacing may suffice for Federal topographic mapping, closer spacing may be needed for property surveys, highway programs, transmission lines, reclamation projects, and numerous other engineering activities. The more closely spaced stations should be so situated that they are readily available to local engineers.

TRIANGULATION

Economic, engineering, and scientific progress has brought an increasing number of requests for higher accuracies in basic first-order triangulation. The range of accuracies is so great that it is necessary to divide first-order into three classes so that satisfactory standards of accuracy can be established.

First-order, Class I: The high value of land in urban areas, the study of small systematic movements in the earth's crust in areas subject to earthquakes, and the testing of military equipment for the National defense require that the triangulation used by engineers and scientists in these varied activities should have an accuracy of at least 1 part in 100,000. Extensive surveys of this nature should make adequate connections with the arcs that make up the National triangulation network. Surveys of such accuracy are designated as Class I of First-order.

First-order, Class II: The basic National horizontal control network consists of arcs of triangulation spaced about 60 miles apart in each direction, forming areas between the arcs which are approximately square. The arcs are planned as chains of quadrilaterals or central point figures, so that the lengths of the sides may be computed through two different chains of triangles. The program for the completion of the network in the United States includes establishing area networks of triangulation within these squares or loops formed by the arcs. To maintain satisfactory mathematical consistency within the area networks, these basic arcs should be measured with an accuracy of at least 1 part in 50,000. Most of these primary arcs have closures in length and position which are of the order of 1 part in 75,000 or 1 part in 100,000. Triangulation of this standard of accuracy is designated as Class II of First-order.

First-order, Class III: There are many additional demands for first-order triangulation within this National framework, and in some cases even independent of the National net. State, county, and private engineering organizations as well as branches of the Federal Government have need for horizontal control that would have a minimum accuracy of 1 part in 25,000. Surveys of this accuracy have long been recognized both Nationally and internationally as first-order and have attained the status of a widely accepted standard.

In the adjustment of the first-order National network, the surveys of Class I will have precedence and should not be distorted to adjust them to surveys executed under the specifications of Class II. When the surveys of Class III are rigidly adjusted to the basic network, their accuracy should be improved.

The placing of first- or second-order control points within the loops of the basic network requires the extension of area networks, cross arcs, or traverses. These specifications list two classes of second-order triangulation.

Second-order Class I: This class includes the networks covering the areas within the arcs of the basic network and, if area nets are not feasible, it includes the cross arcs which would be

used to subdivide the area. The internal closures of this class of survey should indicate an average accuracy of 1 part in 25,000, with no portion less than 1 in 20,000.

Second-order, Class II: This class of triangulation is used to establish control for hydrographic surveys along the coastline and inland waterways. It may also be used for further breakdown of control within any of the higher classes of triangulation. This class of survey or any of the higher classes may be used by engineers for controlling extensive property surveys. The minimum accuracy to be allowable in Class II of Second-order is 1 part in 10,000.

Third-order triangulation: Triangulation of this order should be supplemental to triangulation of a higher order for the control of topographic or hydrographic surveys, or for such other purposes for which it may be suitable. Although it will usually be established as needed for a specific project, third-order triangulation should be permanently marked, and azimuths should be observed to visible prominent objects, so that the work may be available for future projects and miscellaneous uses in the area. Points located by third-order triangulation may be expected to have an absolute position determination within 10 feet or less in relation to the adopted datum defined by higher-order positions in the area. The work should be performed with sufficient accuracy to satisfy the standards listed in Table I.

Standards for surveys below third-order are not included in these classifications.

BASES

Bases for the control of the lengths of lines in the triangulation should be measured by appropriate methods and instruments, so that the standards in Table I are satisfied. Recent developments in electronics indicate that accuracies comparable to those obtained with invar tapes may be expected from the Bergstrand geodimeter or similar instruments. The intervals between bases should be such that the standards regarding strength of figure (ΣR_1) also are satisfied.

TRAVERSE

Traverses are used to supplement all orders and classes of triangulation, and to provide closer and more adequate spacing of horizontal control points. A triangulation net in an urban area provides a frame work for a complete traverse network of first- and second-order accuracies. It is neither economical or feasible to use triangulation for this closer spacing. There are some sections of the United States in addition to these urban areas where traverse can be used efficiently to subdivide the basic network and provide the fundamental spacing of control specified in the National program.

First-order traverses should preferably be connected to first-order triangulation stations of Class I or Class II. If they are connected to Class III of first-order they might be used and given some weight in the adjustment of this class of triangulation. The minimum requirement of accuracy for a first-order traverse is 1 part in 25,000, yet first-order traverse networks, properly executed, will average about 1 part in 40,000. This value is expected and desired. Detailed standards are listed in Table II.

Traverses of second- and third-order accuracy are tied to triangulation or traverse of the same or higher order. They are used extensively for cadastral or property surveys and mapping. For property surveys, the value of the property should, in general, determine the accuracy to be used. For map control, the scale of the map and the positional accuracy required usually govern. Details of these orders of traverse are also listed in Table II.

TRILATERATION

Electronic techniques are increasingly used for the measurement of distances and, through the geometric combination of these distances, networks of trilateration or traverse are developed. In general, the same standards in regard to position closure may be applied as are used in triangulation and traverse.

VERTICAL CONTROL

LEVELING

One of the most important items in the development of a control level net is establishing marks that will remain stable. Releveling has shown that there is considerable vertical movement of bench marks. In some sections of the country there are many factors contributing to vertical change, such as removal of underground water, removal of underground gas and oil, frost action, settling of the soil due to increased moisture content during the rainy seasons, changes in the underground water table, fault lines, earthquakes, etc. Some of these are so deep-seated that in some areas it is impossible to establish a mark that will remain stable. However, some of these vertical changes can be overcome by installing "super" or "basic" marks at intervals along the line of leveling. The usual practice is to establish a concrete-post type mark at one-

mile intervals along a line of first- or second-order leveling, with a "basic" mark at 5-mile intervals. Releveling has shown so many vertical changes that it is advisable to consider releveling first-order lines at least at 25-year intervals, and, in areas where the vertical change is rapid, releveling at least at 5-year intervals. Where vertical change has reached a rate of one foot per year, releveling every two years may be advisable. In addition to the determination of the elevations of regular bench marks, which are installed along the routes of precise level lines, supplementary elevations should be determined at points such as road intersections, railroad crossings, etc., which can be readily identified in aerial photographs.

In first-order leveling the requirement is for a forward and backward running to agree within 4 mm. times the square root of the length of the section in kilometers. If second-order leveling is run with the same equipment as first-order, it can be single run, with loop closures within the criterion 8.4 mm. times the square root of the distance around the loop. In remote areas where a second-order line is longer than 25 miles due to the fact that routes are unavailable for an additional network development, the line should be double-run. This is defined as Class I of Second-order. The single-run area leveling is defined as Class II of Second-order. Summaries of these classifications are listed in Table III.

Third-order leveling should be used to subdivide the area surrounded by first- and second-order leveling and should be performed so that the standards in Table III are satisfied. Trigonometric leveling may be considered as fourth-order leveling, and the elevations thus determined are listed with the triangulation data.

CLASSIFICATION AND STANDARDS OF ACCURACY

TABLE I

TRIANGULATION

	First Order			Second Order		Third Order
	Class I (Special)	*Class II* (Optimum)	*Class III* (Standard)	*Class I*	*Class II*	
Principal uses	Urban surveys, scientific studies	Basic network	All other	Area networks and supplemental cross arcs in National net	Coastal areas, inland waterways and engineering surveys	Topographic mapping
*Spacing of arcs or principal station**	Stations: 1–5 miles or greater as required	Arcs: 60 miles. Stations: 10–15 miles	Stations: 10–15 miles	Stations: 4–10 miles	As required	As required
Strength of figure						
ΣR_1 between bases						
Desirable limit	25	60	80	80	100	125
Maximum limit	30	80	110	120	130	175
Single figure						
Desirable limit						
R_1	5	10	15	15	25	25
R_2	10	30	50	70	80	120
Maximum limit						
R_1	10	25	25	25	40	50
R_2	15	60	80	100	120	170
Base measurement						
Actual error not to exceed	1 part in 300,000	1 part in 300,000	1 part in 300,000	1 part in 300,000	1 part in 150,000	1 part in 75,000
Probable error not to exceed	1 part in 1,000,000	1 part in 1,000,000	1 part in 1,000,000	1 part in 1,000,000	1 part in 500,000	1 part in 250,000

* Additional stations of same accuracy may be interspersed among principal stations.

TABLE I
(Continued)

	First Order			Second Order		Third Order
	Class I	*Class II*	*Class III*	*Class I*	*Class II*	
Triangle closure						
Average not to exceed	1″	1″	1″	1.5″	3″	5″
Maximum seldom to exceed	3″	3″	3″	5″	5″	10″
Side checks						
Ratio of maximum difference of logs of sides to tab. diff. for 1″ of log sine of smallest angle	1.5	1.5–2	2	2–4	4	10–12
OR in side equation test, average corr. to direction not to exceed	0.3″	0.4″	0.4″	0.6″	0.8″	2″
Astro. azimuths						
Spacing-figures	6–8	6–10	8–10	8–10	10–12	12–15
Probable error	0.3″	0.3″	0.3″	0.3″	0.5″	2.0″
Closure in length (also position when applicable) after side and angle conditions have been satisfied, should not exceed	1 part in 100,000	1 part in 50,000	1 part in 25,000	1 part in 20,000	1 part in 10,000	1 part in 5,000

TABLE II
TRAVERSE

	First-order	*Second-order*	*Third-order*
Number of azimuth courses between azimuth checks not to exceed	15	25	50
Astronomical azimuth: Probable error of result	0.5″	2.0″	5.0″
Azimuth closure at azimuth check points not to exceed*	2 sec. $\sqrt{N}$ or 1.0 sec. per sta.	10 sec. $\sqrt{N}$ or 3.0 sec. per sta.	30 sec. $\sqrt{N}$ or 8.0 sec. per sta.
Distance measurements accurate within	1 in 35,000	1 in 15,000	1 in 7,500
After azimuth adjustment, closing error in position not to exceed*	0.66 ft. $\sqrt{M}$ or 1 in 25,000	1.67 ft. $\sqrt{M}$ or 1 in 10,000	3.34 ft. $\sqrt{M}$ or 1 in 5,000

N is the number of stations for carrying azimuth.
M is the distance in miles.
* The expressions for closing errors in traverse surveys are given in two forms. The expression containing the square root is designed for longer lines where higher proportional accuracy is required. The formula which gives the smaller permissible closure should be used.

TABLE III
LEVELING

	First-order	*Second-order*		*Third-order*
		Class I	*Class II*	
Spacing of lines and cross lines	60 miles	25–35 miles	6 miles	Not specified
Average spacing of permanently marked bench marks along lines, not to exceed	1 mile	1 mile	1 mile	3 miles
Length of sections	½–1 mile	½–1 mile	½–1 mile	Not specified
Check between forward and backward running, between fixed elevations, or loop closures, not to exceed	4mm $\sqrt{K}$ or 0.017 ft. $\sqrt{M}$	8.4mm $\sqrt{K}$ or 0.035 ft. $\sqrt{M}$	8.4mm $\sqrt{K}$ or 0.035 ft. $\sqrt{M}$	12mm $\sqrt{K}$ or 0.050 ft. $\sqrt{M}$

K is the distance in kilometers.
M is the distance in miles.

Code of Ethics for Professional Practitioners*

A. It shall be considered unprofessional and inconsistent with honorable and dignified bearing for any professional practitioner:

1. To act for his client, or employer, in professional matters otherwise than as a faithful agent or trustee, or to accept any remuneration other than his stated recompense for services rendered.

2. To attempt to injure falsely or maliciously, directly or indirectly, the professional reputation, prospects, or business of anyone.

3. To attempt to supplant another fellow professional practitioner after definite steps have been taken toward his employment.

4. To compete with another fellow practitioner for employment by the use of unethical practices.

5. To review the work of another fellow practitioner for the same client, except with the knowledge of such practitioner or unless the connection of such practitioner with the work has terminated.

6. To attempt to obtain or render technical services or assistance without fair and just compensation commensurate with the services rendered.

7. To advertise in self-laudatory language or any other manner derogatory to the dignity of the profession.

8. To attempt to practice in any professional field in which the registrant is not proficient.

B. All land survey work shall be done in conformity with the "Technical Standards for Property Surveys"[1] as compiled by the American Congress on Surveying and Mapping and adopted by the ACSM on June 28, 1946 (and as it may be further properly amended by ACSM).

C. The "Statement of Principles" as outlined in the document entitled "Equitable Fees for Property Surveys"[2] as compiled and adopted by the American Congress on Surveying and Mapping in 1949 (and as it may be further properly amended by ACSM), shall be considered as a statement for proper ethical practice herein.

* Adopted by the Property Surveys Division of the American Congress on Surveying and Mapping, January 1959.

[1] *See* SURVEYING AND MAPPING, July–September 1946, Vol. VI, No. 3, pages 210–13.

[2] *See* SURVEYING AND MAPPING, July–September 1949, Vol. IX, No. 3, page 165.

Charts for America's Fastest Growing Fleet

By REAR ADMIRAL CHARLES PIERCE

ASSISTANT DIRECTOR, COAST AND GEODETIC SURVEY

THE SUBJECT of this paper is not concerned with any magical system of electronic positioning, depth recording, or digital computation. It does concern a product of great utility to the small boaters, that rapidly growing fraternity of recreational cruisers. The small boat chart is designed for those who ply our inland and coastal waterways with craft varying from the 16-foot open boat, powered with an outboard motor, to the cruiser whose length and tonnage are limited only by the owner's pocketbook. The novice as well as the experienced seaman, requires more than a boat, a motor, and accessories to take him where his whims may dictate. He needs a reliable chart whether he is boating in familiar waters or cruises far astream.

For assurance of his safe return to port he must have information about the channels, the dangers, the aids to navigation, the times and range of the tide, the times of slack water and of maximum ebb and flood currents, and the location of navigational radio facilities and their characteristics for identification. Standard nautical charts have, of course, been available to all boatmen, but to the small boater with extreme limitations on space and stowage the size of such charts has been a handicap, and the life of the charts is short because of frequent folding and unfolding, exposure to the elements, and lack of protective stowage space. Potential users of the small boat chart include a considerable proportion of our population, and the dollar investment in such craft is quite large. During 1957 approximately 30 million people enjoyed recreational boating to some extent, and two billion dollars were spent on boats, motors, equipment, fuel, and maintenance. Over 391 million dollars were spent for the purchase of new outboard boats and motors, and 750,000 boat trailers were in use in 1957. The present trend is for more powerful outboards, matching the increase in motor-car horsepower during the last ten years. The most recent estimate of outboard motors in use is in excess of five million. Add to this total the 600,000 boats under sail, many of whose skippers are as dependent upon charts as are their brothers under power.

The new series of small boat charts was initiated last March when a committee within the Coast and Geodetic Survey, set up to study the special requirements of pleasure-boat operators for nautical charts and coast pilot information, submitted recommendations for satisfying these requirements. The committee was aided by the U. S. Power Squadrons, and the Coast Guard Auxiliary, both of whom canvassed their memberships by questionnaire to determine user requirements. The Power Squadrons summarized replies from 5,000 operators and the Coast Guard Auxiliary furnished questionnaires returned by 2,000 operators.

In the 1959 appropriations for the Coast and Geodetic Survey, Congress earmarked funds for the development of suitable charts and coast pilot information to promote safety in small boat operation. In July of the same year a program was initiated to develop charts in several formats for the Potomac River. This area was selected for the pilot series of charts because the shore configuration is similar to that of the Intracoastal Waterway and of the major rivers of the country. Further, the area is adjacent to Coast and Geodetic Survey headquarters, which permitted economical investigation and study. Additionally, the Survey's photographic aircraft was in the area and available for revision photography and for obtaining low level obliques. One of the smaller survey vessels was based in Chesa-

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peake Bay for limited support and to assist in determining depths in the channels and inlets and for other chart inspection data. During the first quarter of the fiscal year 1959, press notices about this project resulted in receipt of important suggestions from many individuals concerned with small boating.

Questionnaire replies from some 2,000 boat owners in the Coast Guard Auxiliary indicated 83 percent favored chart sizes ranging from 18×24 inches down to standard page size of $8 \times 10\frac{1}{2}$ inches. A similar percentage desired coast pilot, supply, and facility information on the charts rather than in separate books. About 56 percent voted for page-size charts measuring about $8\frac{1}{2} \times 11$ inches.

Based on the mathematical average of suggested chart dimensions the $14- \times 18$-inch size was adopted. Suggestions for this size included the opinions of some 300 owners who indicated satisfaction with our standard charts measuring 36×42 inches. Four chart formats have been designed in conformance with majority requirements and suggestions.

For comparative purposes, each format covers the same area and contains the same primary information. The presentation of each series has been varied in order to evaluate which is the most suitable and desirable. Each format includes an accurate nautical chart. Water depths of six feet or less are indicated by blue tints, thus emphasizing depths critical for small boat navigation. The average maximum velocity and direction of the current are shown and tidal information is included in the facilities tables. Descriptive aids to navigation have been increased in size and type faces have been specially selected to insure legibility. Insets at large scales are used effectively to emphasize active areas. Compass roses oriented to true North are shown to determine size and placement acceptance and also to learn whether magnetic compass roses are needed. An index of each series is superimposed on an outline chart showing present chart coverage for the Potomac River. The four charts of our regular, nautical-chart series are at a scale of 1:40,000 and measure as much as 3×4 feet paper size. They are among the most popular charts issued by the Coast Survey.

Cartographic treatment is the same on all charts in the four formats. Soundings and aids to navigation are omitted for areas covered by insets to insure use of the more detailed and safer large scale coverage. The red mileage index line is located in accordance with present recommended sailing courses from the mouth of the Potomac River to Washington. No directional courses are shown on the charts. Numerous comments since exhibition of this pilot series indicate a desire for courses along the red index lines. The charts in all four formats are in four colors—buff overprint for land areas; blue tint to the six foot curve; red for restricted, danger, and fish trap areas and to emphasize other features such as aids to navigation, anchorages, pipelines, cable areas, etc. Cultural detail, place names, projection, scales, and notes are printed in black.

Insets have no indicated scale on the experimental charts, and bar scales are found to be necessary.

One-minute subdivision of latitude and longitude is shown. The utility of this information on this series of charts is questionable.

Insets—We use four colors on Series "A"; three colors on series "B"; and two colors on series "C" and "D". This treatment will be standardized. Also use of the blue tint in areas of the base chart covered by insets will be made consistent.

Facility Boxes—Some formats on A-1 carry the facility number and name at the top, while others show it along the left side of the box.

Junctions between charts—Present junctions are indicated on the chart edge. A common mileage symbol on the red index line in addition to the marginal note is desirable.

Storm Warnings—A more definite indication of the actual display point is desirable.

Roads—Designation by highway number

is not complete. Improvement is desirable by adding shields and circles for Federal and State roads, respectively.

Rules of the Road—Presently treated in extremely limited manner. This subject is so comprehensive that it is impossible to do more than mention a few of the rules of the nautical road.

I shall enumerate the characteristics of each format in the pilot series.

Series A is one sheet, printed on both sides. The paper size is 15 × 58 inches, accordian folded to permit ready access to any section between river's mouth at Point Lookout and the head of navigation in Washington. Its scale is 1:80,000 with Washington and vicinity on a scale of 1:20,000. The chart is printed on lightweight paper, high wet strength, such as we use for aeronautical charts. Comments indicate a preference for the use of nautical chart paper.

Series B is three sheets printed on 14½- × 32-inch paper, folded in four panels and tabbed for looseleaf binding. It divides the river into three cruising areas, each sheet carrying the insets, photographs, and facility information for the base chart coverage. The basic chart is printed at a scale of 1:80,000, with the Washington area enlarged to 1:40,000 scale. This format presents insets of active areas, with tabulated facilities keyed to their respective locations. This descriptive information is reproduced on the reverse side of the paper folds. Oblique photographic views of selected areas are printed in half tone. These charts are printed on light weight paper similar to our aeronautical chart paper.

Series C consists of ten sheets measuring 8½ by 14 inches and printed on nautical chart paper. Each page of this series covers its own cruising area, with insets and facility information for the respective base charts portrayed on the reverse side. The scale of the charts is 1:80,000, but the Washington area, displayed on the last page of the set, could be enlarged to the scale of 1:40,000.

Series D is eight sheets measuring 10¾ × 16¼ inches, printed on nautical chart paper in looseleaf form. Facility information and insets at enlarged scale are shown for each area on the reverse side of the previous page. This arrangement permits reference to the base chart and its inset at the same time. The scale of the basic chart is 1:80,000, with the Washington-and-vicinity chart enlarged to 1:40,000 scale.

The responsibility for safeguarding valuable floating possessions and for aiding the small boatman to obtain the most enjoyment from his recreational boating is an important one. It is axiomatic that a chart, to be of maximum value, must present completely reliable information. The motorist with his road map has a relatively simple job of orienting himself and getting from A to B for he has landmarks, cultural features, signposts, route markers, and gas stations to guide him. The new chart series should provide the boatman with a waterway guide that will serve him as well as his road map when he parks his car and comes aboard his flagship.

During the production stages of the experimental charts and since the exhibition of our pilot series, several modifications are under consideration. The increasing use of radio facilities by small boatmen, the cabin cruiser class, indicates a need for showing radio and aero beacons.

Almost without exception small boatmen depend upon the magnetic compass. They want, therefore, magnetic compass roses on these charts in addition to the true compass roses. There were also many requests for larger compass roses than those shown on the pilot series.

Requests have been received for more, large scale insets of anchorage areas and points of call. In any area under consideration the selection of inset enlargements will to a considerable degree depend upon the space available on the series of charts for that particular waterway.

There are also requests for water resistant charts. Our present concept is that these charts will be reprinted annually. They will not be hand corrected prior to issue which is the practice with the standard nautical series. Any method of prolonging

the life of charts by waterproofing, laminates, etc., could result in use of unsafe incorrect information.

Through the courtesy of the Army Map Service, we have several sets treated with a resin-silicate coating known as MARCOTE. We have treated some copies with clear KRYLON and are also printing a few sets on a water-repellant paper known as TEXOPRINT. We plan to get a field test on these during the summer to determine their suitability. These are purely experimental and copies will not be distributed, the same is true with a number of bindings which we are now exploring.

In order to obtain a country-wide evaluation, 3,000 copies were printed of each format. Sets of these four formats and questionnaires have been sent to Power Squadrons, Coast Guard Auxiliary Units, Outboard Clubs of America, local yacht and boat clubs, as well as to all those who forwarded suggestions during initial development. Better than 2,000 such sets have now been distributed and completed questionnaires are pouring in. We now have replies from 4,924 operators and Series A, B, and D are running so close we cannot at present decide which one should be used for the Potomac River.

These charts have created an active interest in the ten boat shows where they have been exhibited. We have received results of questionnaires from five shows representing the choices of 5,357 operators. Replies from these shows indicate a preference for Series B.

Our initial summary of these replies is pointed toward accepting the most suitable format for the Potomac and at the same time extracting pertinent suggestions to correct the final printing. The next step will be to determine formats suggested for other areas, particularly those of different configuration. Finally we will tabulate areas needing such charting.

With this information we hope to be well on the road toward our objective of developing an acceptable chart format with related information designed to provide yachtsmen and small boat operators with the best possible medium for making full use of our waterways. We hope to provide safe operation for the millions of pleasure craft of all types that now crowd many of our national waterways. The small craft chart should prove to be a worthy companion to our five existing series of nautical charts, classified as Sailing, General, Coast, Harbor, and Intracoastal Waterway.

This program could assume formidable proportions if we consider the vast coastline and the contiguous waterways of the United States and Alaska. The Atlantic coastline of the United States exceeds 28,000 statute miles, the Gulf Coast contributes 17,000 more miles, and the Pacific Coast measures almost 8,000 miles. Add to this mileage the 34,000-mile coastline of our newest State, Alaska, and the problem assumes its proper perspective.

You are quite likely to find the small boatman almost anywhere there is water to float his craft. I have run close aboard tiny 35-foot fishing boats more than 200 miles offshore on the Pacific Coast. Cruising into Mexican waters and to the West Indies is fairly common today, so to equate the requirements of all types of small boats today into one type of chart, which will serve the myriad needs and places they wish to sail into, is a most difficult task and the result, at best, will be a compromise. One thing we do know is that a reliable chart is as necessary to safe boating as is the compass, and a chart *designed* for the limited space available in small boats is the best insurance that it will be aboard and that it will afford maximum safety to the small boatman afloat.

Small boatmen will need to be patient with reference to when this series of charts will be available for their particular area of interest. There is always a considerable lapse of time, from the original planning of a chart or map, through the various stages of field surveys, verification of data, cartographic compilation and reproduction, to stocking on the shelves of our nautical chart agencies. There is also the problem of budgeting for a program of the scope of the small boat chart series.

Relief Shading

By PINHAS YOELI

ISRAELI INSTITUTE OF TECHNOLOGY

ONE of the main problems of the cartographer is the presentation of the earth's relief upon his maps. Briefly put, the question is how to present the elevations and depths of the relief by exact geometrical means and yet simultaneously create a direct plastic impression, so that the map user may both measure and see the earth's relief. The solution to exact geometrical presentation has been found by the use of spot heights and contours. But, as every mapreader knows, the contours, especially when the mapreader is not used to contour reading or when the contours are not closely spaced, very often fail to convey a direct plastic impression.

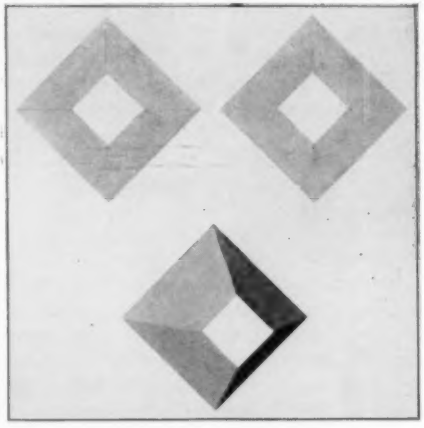

FIGURE 1.

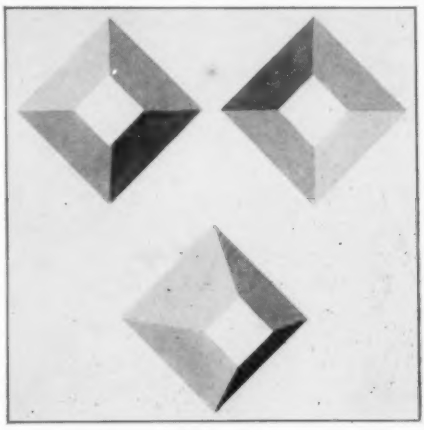

FIGURE 2.

In this short article we shall not discuss the various semiobsolete methods which are or have been used to create a plastic impression of relief on maps. We shall confine ourselves to the application of the so-called "relief shading." If one speaks of shading, there must be lighting too; no shadows without light. "Relief shading" may therefore equally well be called "relief illumination." It is by drawing the lights and shadows which a (possibly imaginary) light throws upon the relief of the map that we wish to create the plastic impression. As to direction of this light, we can distinguish between three different methods of "relief shading:"

1. Vertical Illumination
2. Combined Illumination
3. Oblique Illumination

In Figures 1, 2, and 3, three different prisms have subsequently been lighted by one of the said methods. Prism A (upper left) is an elevation with equal slopes, prism B (upper right) is a negative of A and therefore a hollow, while prism C (bottom) is again an elevation but with different steepness of the slopes.

In Figure 1 light falls vertically from above. Supposing that the slopes receive less light than the horizontal planes, the same principle as for hachuring is applied: "the steeper the darker." All horizontal planes, therefore, remain white, while all slopes are shaded. In consequence of this

principle, the two prisms A and B, whose slopes are all equally steep, are not recognizable; as there is no difference in shading between the elevation A and the hollow B, it is impossible to distinguish between them. Only prism C, whose slopes are variously steep, gives a plastic impression, but even here one cannot tell if prism C is an elevation or a hollow.

If we actually illuminate a three-dimensional model of these prisms from above and photograph it, we hardly get the same picture as in Figure 1. The difference in shade between the slopes and the horizontal planes upon the photograph is negligible. By drawing pronounced shades upon the slopes we actually apply a convention—a none too successful one—as we have seen. Let us, therefore, turn to Figure 2, and see if we cannot find a better solution.

Here, in the "combined illumination," an oblique illumination is added to the ver-

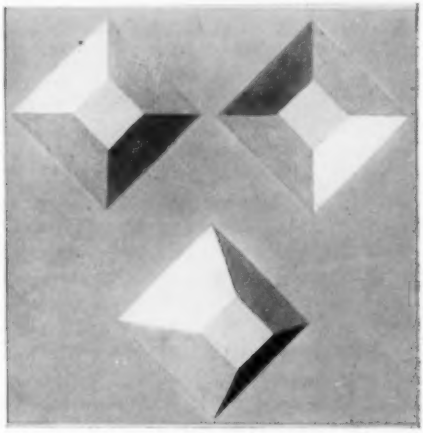

FIGURE 3.

tical one. It is generally assumed that the oblique rays of light originate from the northwestern direction and that they fall upon the plane of the map at an angle of 45°. It was this kind of illumination that was used on the well known hachured and "obliquely" shaded Dufour map of Switzerland.

By this method most of the disadvantages of the solely vertical illumination are eliminated. All three prisms appear plastic and elevation and hollow are easily distinguishable. None the less, this method of shading cannot be recommended, for here again as with the vertical shading, the horizontal planes remain white while every slope receives a certain amount of shade, even those slopes directly facing the oblique light. This is contrary to the *real* effect of an oblique illumination. The northwestern slopes rather than the horizontal planes receive the most intense light. This method of shading therefore does not give a true picture of an obliquely illuminated relief model. It is interesting to note that many of the so-called obliquely shaded maps in use are actually combined shaded maps on which all slopes have some kind of shade and the horizontal planes are left white.

The real natural distribution of light and shadow is shown in Figure 3, where the three prisms are only obliquely illuminated. This is the general effect we get if we throw oblique light upon a three-dimensional model of these prisms. The brightest parts are the northwestern slopes, the darkest are the southeastern ones. The horizontal planes are slightly shaded. A comparison of the three methods of relief shading shows that the third method is the best. It gives us a natural, clear, and pleasant picture nearest to reality. The only unnatural feature of this method is the northwestern direction of the light: the sun never shines upon the hills in the northern hemisphere from the northwest and at first sight it might seem more natural to imagine light coming from the southeast. There are, in fact, some very beautiful oblique shaded maps with light coming from a southerly direction. But it is interesting to note that most people are not used to this direction of light upon pictures and that creates in their imagination the reversed plastic effect: they see elevations as hollows and vice versa. This phenomenon can be confirmed by turning Figure 3 upside down.

From what we have said so far, one might assume that the best way to achieve a plastic relief picture would be to construct a three-

dimensional relief model, illuminate it obliquely, photograph it, and to print it in the corresponding scale upon the contoured map. The difficulty which arises from the fact that the photograph is a central projection while the contoured map is a orthogonal projection could be more or less overcome by photographing the model from as far away as possible. In fact, there is at least one well known cartographical firm which produces shaded relief maps in this way.

This mechanical method, however, has great disadvantages. The construction of an exact three-dimensional relief model for every map takes a long time, is relatively expensive, and would be a heavy burden on the budget of a cartographic office. But its main disadvantage, strange as it may sound, is that an obliquely illuminated and photographed relief model never results in a picture as plastic, clear, and true as a shaded relief drawn by hand. There are two reasons: the first is that at the moment of exposure of the film, the source of light is fixed in its position in space. The slopes of valleys or spurs which run in a northwesterly direction receive the same amount of light on both sides.

We have already seen in Figure 1 that only differences in shade convey plastic impressions. The effect is that valleys and spurs in this direction do not appear at all, or are flattened or distorted.

A further problem to be solved while photographing a relief model is how to get rid of the shadows which the relief features throw upon each other. Although ways have been found to minimize these, still there are no means of eliminating them completely.

The cartographer who draws his shaded relief by hand can free himself from these troubles. Shadows thrown by the relief features upon each other are just not drawn. As to direction of light, he truly assumes a northwestern direction but does not rigidly keep to it. According to the direction of certain relief features, he slightly moves the source of light in his imagination between north and west. This slight shifting of light is illustrated in Figure 4.

In the northwestern and southwestern slopes of the body are three cuttings which lie in the direction of the light. If one were to keep consistently to the assumed direction of light, both slopes of the cutting would get the same intensity of shade. To prevent this, the light has been slightly moved towards the north.

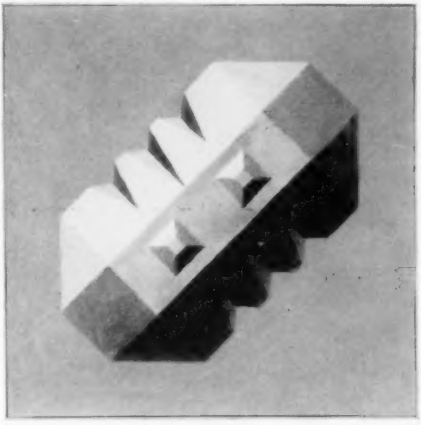

FIGURE 4.

Fig. 5 shows the approximately rounded body of Figure 4 with the addition of contours. There is no difference in principle between the shading of Figure 4 and that of Figure 5; only in Figure 5 the different tones of shades change gradually and not along sharp edges.

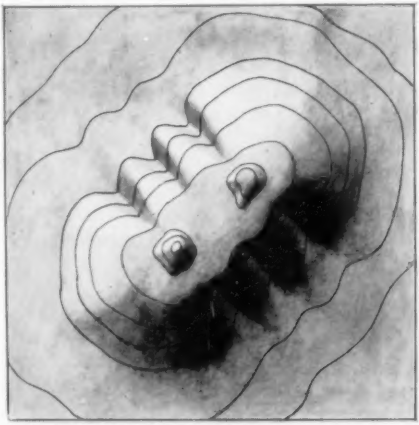

FIGURE 5.

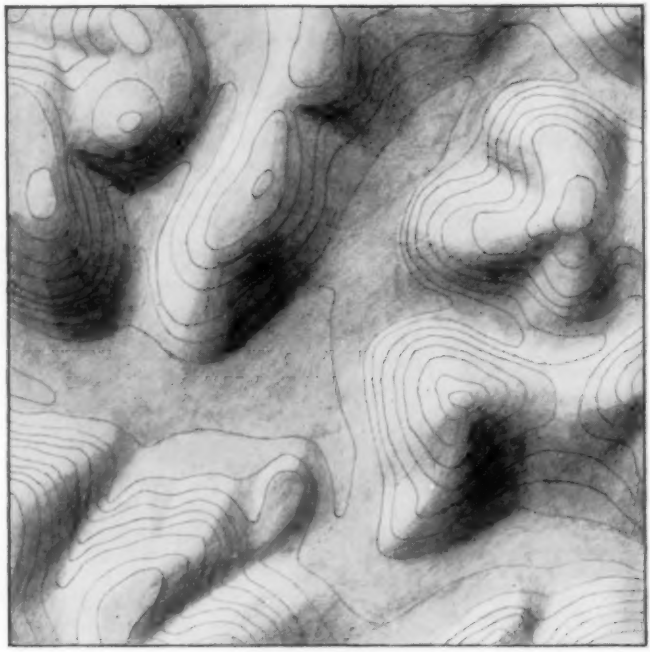

FIGURE 6.

FIGURE 7.

The quality of a drawn relief picture depends upon the precision of the shading. Every little change in the course of the contours must be accompanied by a change of tone in shading. It is often thought that shading is only suitable for a limited range of scale, and only for mountainous or very hilly regions. This is not true. The key to successful shading of every kind of relief in every scale lies in the choice of the appropriate vertical interval between the contours which serve as background for the shading. If the relief on the map is represented by contours whose vertical interval suits the scale and the relief of the mapped area, everything necessary for successful shading is present.

Figures 6 and 7 show the shaded relief of a small area of the Carmel hills near Haifa. The scale of Figure 6 is 1:20,000 with 10 m. vertical contour interval, and that of Figure 7 is 1:100,000 with 25 m. contours. The shaded relief in Figure 7 is, of course, much more generalized than that in Figure 6, but this is a logical consequence of the smaller scale and of the greater vertical interval.

Generally speaking, it may be said that an exactly drawn shaded relief is as detailed or generalized and as true a plastic presentation of the real relief as are the contours which serve as background for the shading.

It is advisable to draw the shaded relief enlarged by about 50 percent. The subsequent photographic reduction improves and beautifies the drawing. The best printing color for shades upon maps is grey. The light grey shade which covers the horizontal planes when the oblique shading is carried out correctly does not disturb the other graphical elements of the map. On the contrary, maps on which the horizontal planes carry a slight colored tone are, even if only from the aesthetic point of view, much more pleasant in their appearance than maps whose planes are white.

A Year with the Tellurometer

By ALBERT V. COCKING

AERIAL CONTROL, INC.

THE ADOPTION of any new technique to surveying and mapping usually poses a challenge and a series of new problems to be met and solved. This has been our experience with the still novel—but not longer untried—Tellurometer system of electronic distance determination.

During the past year, our interest in the possibilities of precise measurement with microwaves has led us to pit the Tellurometer against a variety of surveying tasks. In each application, we encountered new problems of operation and discovered ways to surmount them. The result has been a breakthrough in productivity and an upgrading of accuracy in our major specialty—the establishment of precise horizontal and vertical controls for mapping purposes.

Readers of SURVEYING AND MAPPING are already generally familiar with the use of the Tellurometer. The uniqueness of our experience with the electronic device, perhaps, was its application to a number of very different assignments. As any other first-year user of the Tellurometer will testify, this is a period of experimentation, a series of dilemmas and surprises.

Within this short period, we have found occasion to use this system on traverse work, on the location of offshore drilling rigs, on the control of a wide area for site development, and on the establishment of base lines for missile ranges. It was tested under a variety of climatic conditions, from the heat of the Mohave Desert to the cold exposure of mountain ranges. We found it highly useful to penetrate the offshore fog banks which make sightings with traditional instruments so erratic along the coast. During the year, the Tellurometer was utilized through all kinds of terrain—flat, rolling, and rough.

All of these assignments posed unfamiliar problems to us, and these sometimes required a bit of ingenuity to solve. But almost always the results obtained were sound and satisfactory.

Use of the Tellurometer to locate an offshore oil drilling rig over a predetermined position was one of these unique applications. Apparently, this was one of the first such experiments.

Using the Tellurometer to position an oil drilling rig five miles offshore. A remote unit operator maintains contact by built-in radio with his colleagues operating the master unit aboard a small vessel out of sight in the fog.

Here, the problem was to put the boat in a specified position, where drilling operations were deemed profitable. Adequate Coast and Geodetic Survey triangulation stations were available along the coast, but continual fog made observation from them to the vessel about 5½ miles offshore impossible.

The Tellurometer was brought in as a possible solution. The master unit was set

on the boat, and the remote unit on one of the Coast and Geodetic Survey stations. Radio communication was established, using the instrument's built-in units. Because we knew the distance the target location was from this point, it was easy to direct the captain to cruise along a line toward that location. After reaching the approximate location, the captain moved the ship in an arc, using the known distance, which was continually being measured by the Tellurometer, as a radius. Along this arc the crew dropped a line of buoys. Then the remote unit was moved down the coast about eight miles to another C. & G. S. station. With the new distance determined, the captain was advised to proceed along the line previously established and marked by the buoys. When the correct distance was noted on the oscilloscope, another buoy was dropped to mark the correct location of the drill rig. The ship was then anchored in this position and a measurement to a third station was taken as a check. Refinements were then made and the location determined to the desired accuracy.

Because the operation was carried on with the master unit located near the wheel house of a converted mine sweeper, the roll and pitch of the vessel caused considerable movement and created a problem in obtaining course readings that were free from ambiguities. This was solved by taking a quick set of A and B, then A and C, and A and D readings when the ship was approaching the maximum or minimum of its roll or pitch. Then, once the course readings were determined, the revolutions of the break as indicated on the A presentation were counted. By this method it was possible to quickly and accurately ascertain the correct distance from the shore station at all times.

(Readers should bear in mind that this operation required skilled operators, techniques significantly different from those employed over land, and considerable patience.)

Another unusual assignment on which the Tellurometer proved valuable was that of verifying precise locations for positioning instruments along part of a 500-mile range to measure missile performance. As many other surveyors know, the scientists designing these facilities demand extreme accuracy. Our assignment was to install a single 38-mile base line against which other lines could be checked. A helicopter was chartered to ferry the remote unit operator across an intervening valley line. Within 30 minutes, the measurement had been taken. The nature of the terrain would have required considerable triangulation and it is doubtful that the resulting accuracy would have been of a high enough order to satisfy the agency. The Tellurometer measurement agreed within 1 part in 230,000 with first-order Coast and Geodetic Survey points.

Another application, on which the speed of the microwave method made completion much faster, was an assignment to establish numerous new stations on the unmapped site for an Air Force Base, preparatory to photogrammetric mapping. Close accuracy was not a requirement. In one week, our Tellurometer crew was able to put in enough points to adequately control nearly 15,000 acres. Some 42 stations were occupied in that short period.

To accomplish this feat, the master unit was set up on a triangulation station 15 miles outside the area to be controlled. The remote unit was mounted on a jeep which cruised back and forth through the area. The operation was completed in six days, a chore which by traditional methods would have taken about three weeks.

A similar assignment was to establish control over a 4,400-acre site on which the completely new city of Churchill, Arizona, is to be developed. A tower was erected to hold the master unit and a theodolite. The remote unit was installed on the bed of a pickup truck. Here again, the requirement was for speed, not close accuracy. The driver, with the aid of an assistant with plumb bob, would drive directly over a point. The measurements would be made, in both azimuth and distance, in quick time. More than 100 points were set, including determination of verticals, in two weeks.

Without the Tellurometer, it would have been necessary to triangulate and turn angles through the brush, which was about

seven feet high. It would probably have taken twice as long.

Our Tellurometer was subjected to some extremes in temperature. On an assigment for the Bureau of Reclamation in the Mohave Desert, we used the Tellurometer at temperatures ranging up to 120 degrees. The only real difficulty encountered in this operation was the problem of keeping the crystals synchronized. We tried to solve this one by removing the sides and letting the wind blow through the instrument. But even though we had flagging around the instrument to prevent sand from getting inside, we never felt that this was an adequate solution. More satisfactory results were obtained when we placed a chemical filled plastic ice bag on top of the instrument.

Running traverse for highway locations is an excellent application of the system. In establishing control for such a project recently we realized a time saving of several weeks. The Orange County (Calif.) Road Commission was under considerable time pressure to obtain maps and plans for a 22-mile stretch of road in order to qualify for Federal funds. Pacific Air Industries of Long Beach was asked to map the route photogrammetrically, and Aerial Control, Inc., in turn, was called upon to furnish control. It took a two-man crew only three days to complete the Tellurometer traverse, even though the terrain varied from rolling to very rough, and the area was bushy and sometimes heavily wooded. A conservative estimate is that traditional methods would have taken 20 days.

Another assignment for the same agency posed entirely different problems. Again, working with Pacific Air Industries, we were asked to establish control for aerial mapping of the proposed location of a flood control channel. Here, terrain was not the problem; it was traffic. The job required that we shoot the microwaves across congested streets and highways and there was hardly a time when we really had a clear line of sight. It was so difficult to obtain readings that we decided the waves must be bouncing off the passing vehicles.

We overcame this obstacle satisfactorily by taking the minimum reading of the circle break on the oscilloscope and also by utilizing only the longer wave lengths at the lower frequencies (from 9 down). This may have reduced the accuracy possible with readings taken over the complete range, but it gave us stronger signals. In addition, we elevated the master unit a couple of times on nearby park benches and thus cleared the congested traffic lanes.

Portability of the Tellurometer was an asset to crews for Aerial Control, Inc., who used the electronic distance-determination system on a variety of assignments, many of which were in rough terrain.

We suspect that errors of 0.10 to 0.20 of a foot crept in under such conditions on shots of about a half-mile, but better accuracies would have been costly and difficult to obtain with other techniques and within the time limits specified.

(The manufacturer of Tellurometer systems announces that a telescoping mast, which will raise the antenna of the master unit to a maximum of 40 feet, to clear obstacles in the line of sight, has been designed and will be available soon.)

Recently, working with Sloan and Associates, we accomplished the control work for photomapping to be used on a proposed road approximately 36 miles in length. The route covers part of the Tehachapi and fol-

lows along the Kern River Canyon. The country is rough and almost inaccessible. Horizontal and vertical control was established by using a helicopter to move the Tellurometer crew from mountain to mountain and from one side of the canyon to the other. A job that ordinarily would take from two to three months was completed in 15 days.

The experience on these and numerous other assignments has given us a much better working knowledge of what the Tellurometer can do and how to overcome obstacles which, at first thought, seem to prohibit its application. The versatility of microwave distance measuring has been repeatedly demonstrated through the past year, enabling us to give a client accuracy usually in excess of his needs and speedy completion beyond that possible by previous methods. This is a practical consideration of which private surveyors in private practice, particularly, are keenly conscious.

Firms in this position are aware of an increasing variety in the assignments being given to them, and their working tools need to be adaptable to a range of field conditions and productive of a variety of results. Electronic distance measurement can meet these qualifications, if the surveyor using this method is able to exercise imagination and resourcefulness.

Empire Survey Review

In the January 1959 issue of the *Empire Survey Review*, a special notice, printed in red, was "tipped in" with its back to the "Contents" page. The notice read as follows:

"NOTICE—It is regretted that, owing to the rise in postage charges during recent years, it has become necessary to increase the price of the *Empire Survey Review*.

"The new rates will commence with the April issue and will be as follows:

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—EDITOR

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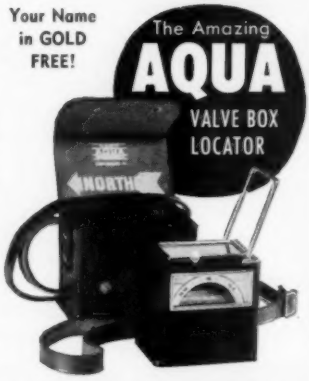

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Report of Fees & Salaries Committee, Property Surveys Division, A. C. S. M.

JAMES L. BELL, *Chairman*

I. IN RETROSPECT

In March 1957, the Property Surveys Division of ACSM appointed a Fee & Salary Committee whose study was to review the "Equitable Fees for Property Surveys, Principles and Recommendations" as printed in the ACSM Journal in 1949.[1] After one year of consideration, considerable correspondence with Surveyors throughout the USA, and a limited amount of investigation as to present practice, the Committee reported, in March 1958, concerning this review.

The Committee's report of March 1958, briefly, recommended that the Equitable Fees for Property Surveys, as recommended by ACSM in 1949 is, in general, permanent in its value to the Surveyor and the Committee did not recommend any changes. However, attention was called to the evidence of variations in general practice with reference to fees. The Committee further recommended to the Property Surveys Division that an extensive study be made of the present practices with reference to Fees & Salaries among Surveyors throughout the U.S.A. As a result, the Property Surveys Division and the Board of Directors and Officers of the American Congress on Surveying and Mapping authorized this Committee to proceed to make this survey and to complete its results and to make its report on this study at the March 1959 meeting. A budget was alloted for printing and mailing 5,000 questionnaires, and this survey was actively entered into by your Committee in May 1958.

II. PROCEDURES USED TO OBTAIN PERTINENT DATA

Your Fee-Salary Committee first set about to compile a mailing list of 5,000 persons who were to receive the questionnaires. The best available source was, of course, the roster of Surveyors and Engineers in each State. These rosters were obtained and a study was made of each page in each roster in an effort to determine, from the listing itself and any other information given, exactly which persons were practicing Land Surveying. Without a doubt, many questionnaires were sent to persons who were not in the practice of Land Surveying, but whose listing in the roster was indicative of such practice. In many cases, those persons were kind enough to return the questionnaire, permitting it to be sent to a more useful source. The mailing and remailing and follow-up letters were pursued for approximately three months. In September 1958, it became apparent that a few States were not properly represented in the return of the questionnaires. Efforts were then made, through the local Chambers of Commerce in major cities affected and through as many other sources as could be contacted, to get a list of local Surveyors who would be willing to give us the information needed. Through these follow-up methods, the Committee was able to get fair representation from all areas. Of 5,100 questionnaires mailed, approximately 1,000 answers of some kind were returned. Of this number, only 469 were complete in nature. This group was made up in its entirety of Surveyors in private practice and, in most cases, are representative of reports from different communities within a given State. The incomplete returns which were received were generally from Surveyors and Engineers who had retired, were in limited practice, or from some similar circumstances

Presented at the Annual Meeting of the Property Surveys Division of the American Congress on Surveying and Mapping, Washington, D. C., March 12, 1959.

[1] *See* SURVEYING AND MAPPING, July–September 1949, Vol. IX, No. 3, pages 165–167.

and were not in a position to fully assist in this survey. However, some information was gleaned from almost all returns. As might be anticipated, it was impossible to ask all those questions which would apply to any given areas, and we found that the phraseology in the practice in a given service in different States varied. For this reason, many letters accompanied the questionnaires, and much information was gleaned from the written page as well as the numerical tabulation.

III. TABULATED RESULTS OF FEE & SALARY SURVEY

You are referred, at this time, to the Chart[2] representing the tabulation of the survey. The information on this Chart cannot be presented as 100% accurate representation of the practice in a given State. It is, however, representative of the result of an extensive study of the individual practices of practicing Land Surveyors representing approximately 400 communities in the U.S.A.

It seems apparent that one of the indications of coordinated practice among Surveyors in a given community is the availability of a published minimum fee schedule subscribed to by the Surveyors of that particular community. An over-all study of the comparative practices indicates that any coordinated efforts on the local level, among Land Surveyors, result in improved services to the public as well as improved relationships between the practitioners. Referring to the Fee Study Chart, it is noted that thirteen States have Land Survey fee schedules affecting cities, counties, and other local political subdivisions. Many communities not having such a fee schedule have inquired from your Committee relative to obtaining information as to what is in common use elsewhere. These interested communities are referred to such outstanding fee schedules as appear noted on the Chart from New York, New Jersey, Chicago, Illinois, Georgia, California, Washington State, and others. For the purposes of this particular survey, a Surveyor's fee schedule was considered as being that schedule which deals with actual "dollar and cent" values relative to Land Surveying practice. Those States having a "formula" for arriving at fee schedules and which do not note actual fees were not considered as having a "minimum fee schedule."

With reference to a study of individual and area fee practices, it is at the same time necessary to compare this practice to salary scales. It should be noted at this point that Land Surveyor contracts with union labor groups were noted in only two States. In California, the practice is widespread and apparently deep-seated in nature. In Nevada, some indication was received, but the impression being that the practice is minor in nature compared with non-union practice. In some of the other States, there were notations that union labor was used on construction layout of highways, etc., but in no instance was there any other indication of union labor in Land Surveying operations.

The Chart indicates a comparison between fees and labor cost under the column marked "Ratio." The ratio, as indicated thereon, is the relationship of the actual salaries paid to a 3-man survey party (composed of party chief, head chainman and chainman) as compared to the fee charged to the client for this 3-man crew. This ratio was arrived at by dividing the "fee charged" by the "salaries paid," as above indicated. Since this ratio does not reflect variations in requirements for office personnel, it obviously can be used only as a comparative basis for reflecting what various Surveyors are allowing for various overhead in addition to the "rule of thumb" of cost plus 100%. The national average "ratio," as a result of this study, is 2.195. It is noted that in some areas where salaries are high and fees are low, that the ratio computed less than 1.5. In other areas, due to higher prices, the comparative ratio is over 3.000.

Reference is made at this time to "Equitable Fees for Property Surveys," as adopted by the American Congress on Surveying and Mapping and referring specifically to

[2] This chart (folded) will be found "tipped in" on the last page of this issue of SURVEYING AND MAPPING. Note:—In opening the chart for inspection, unfold first to the left and then upward, to avoid tearing.

the formula recommending a minimum charge of "salary cost plus 100%." The result of this present fee study indicates that the total employees of those Surveyors polled average 8.5, of which the average field employees total 6 and the average office employees 2.5. This indicates that approximately 30% of all salary expenses is office salary expense. Applying this information to the formula used to arrive at the ratio on the Chart, it is obvious that a ratio of approximately 2.3 between field salary expense and direct charge to the client is necessary in order to cover average office salaries and to obtain cost plus 100% on an average basis, as referred to in our present study.

No "Ratio" recommendation is included herewith toward individual practice, and this reference is made with the specific intent of indicating that many Surveyors are not receiving cost plus 100%, as evidenced by the State averages on the Chart. This may be caused in part by inadequate accounting as evidenced by the fact that 75% of those Surveyors polled indicated that, in their opinion, they did not use adequate cost accounting systems.

Another hazard in the "cost plus 100%" formula which should be pointed out at this time is the multiple complaints received through this study indicating that part-time Surveyors who are employed by various public agencies are offering their services as Surveyors at a fee far below what the Surveyor in full-time practice can compete with. Investigation of this bears out the obvious fact that the part-time Surveyor who has a full-time income elsewhere does not have the direct expenses of the full-time practitioner. If this "part-time" Surveyor applies the cost plus 100% formula to his practice, then he is in ethical practice (from the standpoint of the best information available to him) and, at the same time, might well be considered unethical since he is (without intention) lowering the fees and consequently the quality of the service to the clients in that particular community. It would seem that this is one of the best arguments for a Minimum Fee Schedule on a local basis. The part-time practitioner would then appear to be in unethical practice if he *did not* adhere to the minimum fee schedule. From the best information available to your Committee, the part-time practitioner would welcome this situation as much as the full-time Surveyor, and it would be beneficial to the client as well as the profession.

In most communities, the individual Surveyors, or the local Surveyors as a group, have established a minimum fee for a survey to mark the corners of old existing platted lots. Obviously, a national average pertaining to this particular practice would be of no actual value toward establishing a price in a given community. However, it should be noted that the national average from our study indicates the practice of a "minimum fee" of $30.00 for staking the average platted city lot, and an average "billing fee" of $37.50 for same. It is interesting to note that the great majority of communities report fees very close to this. The exceptions to the rule are those areas having strong fee schedule regulations which enable a much higher minimum price in most cases, and also excepting those areas having union labor. It is noted that in a given community that the average price for lot surveys charged by various Surveyors has been found to range from as low as $25.00 to as high as $65.00 for the same lot. Among the reasons which have been indicated for this great variation in local fees, is the fact that the old practitioner with many years of experience and a great volume of notes can, many times, do in a very short time what is takes the well qualified but newer practitioner a much longer period of field time to accomplish. In these cases, many times without realizing the impact on the profession at large, the old practitioner keeps his fees down to a level which causes a competitive problem between the old and the new practitioner, resulting in lowering of standards of the service to the client in some cases. It seems obvious that a minimum fee schedule agreement on the local level between these Surveyors would have obvious monetary advantages to all and would undoubtedly encourage a high standard of practice within the profession.

Regardless of local practice with reference to formulas on a "per pot," "per foot," "per acre," or other basis, there remains much surveying which can be logically approached only on a "per hour" or "per diem" basis. Within a given community, we have found that generally the "per hour" price for a survey crew is more nearly standardized than any other type of fee arrangement. However, reference to the Chart will indicate a minimum and maximum which was encountered within a given community and, in some cases, a wide variation of fee practice is noted. In certain States, the practices with reference to rural (or small town) hourly fees are noted separately from those of metropolitan areas and, in many cases, are as much as 50% less than the metropolitan fees. Many letters were received from rural practitioners deploring the condition in which they find that the value of the land or some other condition affects their ability to obtain a reasonable fee. Many cases were noted of rural Surveyors who charge as little as $3.00 an hour for their own time and allow the client to furnish the remainder of the help and transportation. No criticism is intended herein in mentioning this practice, and full appreciation is herewith expressed of the individual problems called to the Committee's attention. It is suggested that a partial solution of this condition may be accomplished by the State or nearby metropolitan Surveyors Associations giving assistance to the rural and small town Surveyor by education of the public as to the professional value of the practitioner's service and by whatever other means they might devise to assist in raising standards of rural practice.

Various communities have indicated means of arriving at fees which seem peculiar to that particular area. In most cases, metes and bounds surveys, as well as the office work relative to preparing metes and bounds descriptions, are handled entirely on an hourly basis. Farm surveys are, however, approached in some communities by a "per acre," a "per lineal foot" based on exterior lines, or a percentage of the taxable value of the land as a basis. These formulas are all dependent on local conditions and are mentioned herein as an indication of the fact that some Surveyors have given considerable study on a local basis toward coordinating their fees with the monetary problems of their clients.

"Loan Surveys" or "mortgage" or "improvement" surveys, as they are sometimes called, are one of the most controversial practices in Surveying. In most communities, these are made without actually marking the property lines and are a requirement, in general, of the Title Attorneys or investors as a result of an application for a mortgage on the given property. In some communities, this work is done on a highly competitive basis which constantly forces the fee down when, at the same time, those organizations requiring these surveys are making their requirements more stringent relative to the information shown. In other communities, the Surveyor has refused to do this work on any but an hourly basis, and, in still other communities, the standard fee received is more than sufficient to allow for the complex situations often encountered. Forty-one percent of the Surveyors polled indicated a definite standard fee for this type of survey. In eight States, we received no indication of standard fees and all answers indicated hourly fees, only, for loan surveys. The national average fee is indicated as $35.00. The variation in practice, however, for standard fees ranges from $7.50 minimum to $100.00 maximum for loan surveys of residential lots in various communities. This also appears to be a field in which local minimum fee schedules would raise the standard of service to the client.

The Practice of Surveying and Engineering relative to subdivisions of platted lots is also varied. Twenty-four States indicate local practitioners who break all subdivision charges down to a "per lot" fee. Five States indicate practice of construction layout and design on a "per foot" basis, in general, the actual field work being about 12¢ per lineal foot for staking curbs, sewers, and similar construction layout. The charges on a "per lot" basis for all Surveying and Engineering including design of sewers and streets varied from $60.00 minimum to over

$200.00 maximum. This is the charge for bringing a given lot to all the development stages necessary for the developer to deliver the particular lot to the builder. This does not include any work such as plot plans for the builder or staking the house and similar work. In general, the total average fee encountered on an FHA subdivision, including all Surveying, Exhibits, and Engineering as above qualified, is $125.00 per lot in cases where large volumes of lots are indicated.

In most instances, the practice of staking houses for construction is done on a "per house" basis, although hourly charges are encountered occasionally. In this study, the national average for staking one house on a lot already surveyed is $25.00. For staking three or more adjacent, the average is $17.50. It should be noted, however, that a $50.00 charge for a single house is not at all uncommon. Those areas having minimum fee schedules, in general, approach this work on an hourly basis or at a "per house" figure sufficiently high to allow for complicated layout and professional responsibility.

Referring to the practice of the Surveyors who answered this poll, 61% were not members of ACSM; 20% indicate that they never, under any circumstances, submit a firm bid on a Surveying job to a client; 4% indicate that they always, under all circumstances, submit a firm bid. The remaining 76% indicate that it depends entirely on the type of work involved; 80% indicate that the other Surveyors in their community follow no known fee schedule of any kind; while 67% indicate that they personally follow a fee schedule of some sort at all times, whether of a general local nature or a fee schedule which they have devised to control their own practice. It must be noted that some communities submitted excellent local fee schedules subscribed to by many local Surveyors, but, in individual reports from member Surveyors of that group, we still received the answer that, in their opinion, many Surveyors did not adhere to that fee schedule. Obviously, the success of a good fee schedule of this type is entirely dependent on its support by the subscribing members.

One of the prominent professional services which a local Surveyor furnishes to the public is that of an expert witness in court testimony. This occasion would appear to require a fee in dignity with the occasion and the professional service involved. Forty-eight per cent of the Surveyors polled receive $50.00 or less per day for this service, while forty-two percent of those polled receive $75.00 or over. One hundred dollars per day is in common use in the latter group. Some local practices were encountered, however, where the court appearance was more or less "thrown in" with reference to a survey previously done. On other cases, as little as $3.00 an hour for the Surveyor's court time was indicated. A local minimum fee schedule should, by all means, indicate a minimum fee for court appearance which will dignify the occasion and encourage proper preparation and submission of evidence by the practitioner.

IV. COMMITTEE RECOMMENDATIONS TO PROPERTY SURVEYS DIVISION OF ACSM

It is recommended that the Property Surveys Division take action to encourage local Surveyor Associations, Societies, or Affiliate Groups to subscribe to a local Minimum Fee Schedule in the best interests of the profession of Land Surveying.

It is recommended that the intended result of a Local Minimum Fee Schedule should be (a) To encourage the highest standards of professional practice; and (b) To accomplish the closer association of Land Surveyors on the local level resulting in the solution of other mutual problems.

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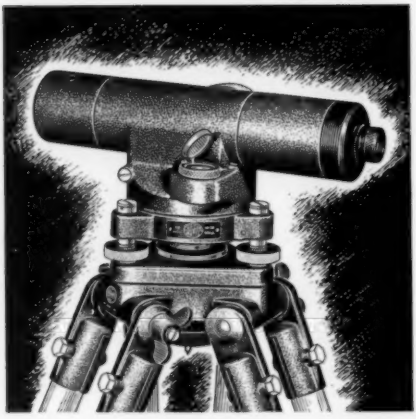

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The Necessity of a Four-Year Program of Surveying and Mapping

By KENNETH N. MENDENHALL*

A SHORTAGE of adequately trained and properly educated personnel, who have attained a technical and professional level of proficiency, is being urgently felt in the field of surveying and mapping. In fact, this shortage of personnel, in certain branches of surveying, is nearing the point of crisis. It will eventually affect both the excellence and the volume of the work undertaken by the profession, and this, in turn, will increase the cost of having property surveyed; increase the cost of construction of highways, buildings, and harbors; and limit the number of undertakings connected with the revision of global maps, which is one of the areas of scientific exploration made possible by the launching of the satellites. Science has created for the surveying profession opportunities which will ultimately be of world consequence, but these opportunities can be fully utilized only if there are professionals trained to use this knowledge. It has become increasingly apparent in the last few years that the existing methods of surveyor training do not fully meet the needs of the profession. With this in mind, the following is written as a layman's suggestion for the possible solution to the existing problem.

The situation that presently confronts the surveying profession is involved, and in some respects it has become knotty. There are numerous issues complicating the situation, but I shall consider here only those of primary consequence. These are as follows: The lack of adequately trained personnel, the demand for surveyors resulting from present and future development and redevelopment of land, and the present disagreement between professional land surveyors and professional engineers who are concerned with solutions to the existing problems of the profession. In order to understand the over-all nature of the problem, each issue must be scrutinized.

One reason for this lack of personnel is the unattractive starting salary offered the surveyor; his income is substantially below the $435 a month earned by the civil engineer. Thus, salary alone turns many prospective personnel away from surveying.

A second factor that contributes to the impending crisis is the demand for surveyors resulting from present and future development and redevelopment of land. The Federal and State highway programs, the recent trend toward suburbanization and toward slum clearance, and projected harbor developments in the Great Lakes area (resulting from the completion of the Saint Lawrence Seaway Project) are rapidly depleting the supply of professional people in the field of surveying. These demands are in excess of the continuing demands being placed upon the profession by private construction firms, Federal and State governmental agencies, and private land owners.

The third factor complicating the over-all situation is the present disagreement within the profession. In the last decade, considerable disagreement has arisen concerning the determination of proper ethics and procedures for surveying. This disagreement must be settled because a unity among the professional people concerned must first be obtained before other problems can be solved.

It is the opinion of many professional surveyors and engineers that these differences of opinion can be most effectively resolved by creating a course of study that would insure professional training and status for the surveyor engineer. There is at present no program for such training; the alternatives are the civil engineering program, the tech-

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nician's course, and apprenticeship training. The civil engineering program, as a method of educating the surveyor, is creating considerable dissatisfaction among professional surveyors because the engineering curriculum in the majority of colleges does not include related subjects such as "Theory of Land Surveying"[1] and "Property Law"[2] which would give the graduate depth in background material. In addition to this, the civil engineering curriculum has almost completely dropped the teaching of any form of property surveying, and some engineering programs require only one course in pure surveying. (This course is usually given at the end of the freshman year in the form of a summer course carrying ten to fourteen hours credit.) The marked absence of courses in surveying suggests that colleges of engineering regard such courses as of little importance to their graduates.

In the fall of 1957 a technician program was introduced in several colleges in the United States as a means of training surveyors. From an academic point of view this program is more seriously deficient than the civil engineering curriculum, although it will provide more practical knowledge and experience. The aim is to prepare the student as a technician. If it is realized that this type of course is to accomplish no more than this, then it is adequate. However, if this program is expected to qualify its graduates as replacements for engineers, then it is definitely inadequate. Technicians will remove the burden of routine field work from the engineer and allow him to turn his attention to problems of a more technical nature. The graduates of a technician program will be a valuable asset to a profession. However, it must be realized that this form of training is of necessity shortened to two years. Emphasis is placed on techniques of surveying (instrumentation) and there is little time allotted for background material.

The third method to be considered is the apprenticeship program. Mr. Ralph Moore Berry admirably expresses the value of this plan:

"Although this system served in the past, it is not the present-day approach toward professional education. It served admirably for the training of plumbers, but fails miserably as a means of inspiring thinking which, in the final analysis, is the true product of the profession. The apprenticeship system makes no provision for extended instruction in such abstract subjects as mathematics and basic science. The practitioner on whom falls the responsibility for training under the apprenticeship system is seldom qualified to instruct adequately in these abstract subjects, seldom has the time available to devote to adequate instruction, and is usually inclined to be scornful of any material not directly applicable to the practice of his office. This produces an atmosphere that is conducive to learning techniques, "tricks," short cuts, etc., which, while essential to assembly line production of the modern surveying office, are not formative of the background and thinking habits of a new generation of professional men."[3]

Each of these programs has definite deficiencies as a means of educating the surveyor. The civil engineering program is formal enough but it lacks in specific surveying courses in property and land surveying. The technician program, to some extent, has the proper curriculum, yet it lacks essentially in depth of background material because the work is covered in a two-year period. The apprenticeship program is lacking in many respects and should only be considered as a type of preprofessional education.

Because each of these programs is lacking in some essential respect, a specially planned, comprehensive course of study must be evolved to provide a professional level of education for the surveyor engineer. This can best be accomplished by introducing a

[1] A course dealing with subdivision of public land; study of original surveys; resurveys; and subdivision surveys. (Refer to Ferris Institute Bulletin 1957–58.)

[2] Property Law (Real Estate) dealing with easements, land description, and legal interpretations. (Refer to Michigan State University Catalog 1957–58.)

[3] Ralph Moore Berry, "Is Education for the Professional Land Surveyor to be Accomplished Within the Framework of the Civil Engineering Curriculum?" SURVEYING AND MAPPING, January–March, Vol. XVIII, No. 1, page 21.

four-year program in surveying and mapping. Such a program would eliminate many of the present difficulties with which the surveying profession is beset. It would formally raise surveying to a professional level and thus insure a higher degree of competence, a more desirable salary scale, and a greater degree of public respect. All of which would help to attract able young men to a profession which is dependent upon them.

I am not alone in this opinion. A series of interviews with land surveyors, professional engineers, and professional educators, has convinced me that the men who are working with both the practical and theoretical problems involved are almost unanimously of this opinion.

The suggestions that I here present are largely based on the recommendations of these specialists.

The curriculum of the freshman year would be comparable to that required in other branches of engineering. The following three years should include these courses as minimum requirements:

MATHEMATICS:
- (a) Through Calculus II, with at least one course in Electronic Computing

SURVEYING:
- (a) Basic Principles of Surveying
- (b) Subdivision Surveying
- (c) Design Data Surveying
- (d) Construction Surveying
- (e) Basic courses in:
  - (1) Triangulation
  - (2) Geodesy
  - (3) Photogrammetric Surveying

CARTOGRAPHY:
- (a) Basic courses in:
  - (1) Topographical Drafting
  - (2) Map Design

LAW:
- (a) Business Law
- (b) Real Estate and Personal Property Law

In addition, there should be a course in the Theory of Design and Construction which would familiarize the surveyor with the problems encountered by the civil engineer. Most of the senior year should be arranged so as to allow the student to specialize in one of the branches of surveying such as Cadastral Surveying or Geodesy.

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MAGAZINE ARTICLES

General Interest

SOME EARLY AUSTRALIAN SURVEYORS. S. E. Reilly. *The Australian Surveyor,* Vol. 17, No. 3, September 1958 (Presidential address at the Fifth Annual General Meeting, Institution of Surveyors, Australia, Brisbane, May 28, 1958.)

UNITS OF MEASUREMENT. R. T. Francis. *The Australian Surveyor,* Vol. 17, No. 3, September 1958. (Historical highlights of units used from the dawn of history to modern times.)

THE NINTH INTERNATIONAL CONGRESS OF SURVEYORS. Hans Klinkenberg. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Brief report on the August 28–September 4, 1958, congress of the International Federation of Surveyors held at Sheveningen and Delft, Netherlands.)

THE ALBERTA-NORTHWEST TERRITORIES BOUNDARY. R. W. Clark. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Parliamentary approval of newly established boundary line makes Alberta first western province to have its entire perimeter surveyed.)

PIPELINES: ARTERIES OF ENERGY. (Author not named.) *The Lamp,* Vol. 40, No. 4, Winter 1958–59. (Emphasizes extent of the oil and gas pipeline systems in the United States.)

HOW A HIGHWAY GETS BUILT. (Author not named.) *The Lamp,* Vol. 40, No. 4, Winter 1958–59. (Describes surveying and engineering operations in connection with construction of a part of the Interstate Highway System in New Hampshire.)

PROFESSIONAL CONDUCT. A. J. Lines. *The Australian Surveyor,* Vol. 17, No. 4, December 1958. (Sets forth code of ethics for surveyors.)

THE TEXAS ENGINEERING EXPERIMENT STATION SERVING THE PEOPLE OF ITS STATE. Louis J. Horn. *Texas Engineering Experiment Station News,* Vol. 9, No. 4, December 1958. (History of its administration 1914 to date.)

NAVIGATING UNDER THE NORTH POLE ICECAP. Lieutenant Shepherd M. Jenks. *United States Naval Institute Proceedings,* Vol. 84, No. 12, December 1958. (Describes two methods of navigation used by submarine *Nautilus.*)

INTER-AMERICAN TRANSPORTATION PROGRAM. Colonel Raymond L. Hill. *The Military Engineer,* Vol. 51, No. 339, January–February 1959. (Account of special communications circuits around the Gulf of Mexico and the Caribbean Sea.)

THE BRADDOCK CAMPAIGN, 1775. George T. Ness, Jr. *The Military Engineer,* Vol. 51, No. 339, January–February 1959. (Part I, Plans and Purposes, emphasizes engineering and surveying preparations; Part II, in the March–April issue, covers the march from Cumberland to the end of the campaign.)

THE RED RIVER BOUNDARY CONTROVERSY. Monroe Billington. *The Southwestern Historical Quarterly,* Vol. 62, No. 3, January 1959. (An account of the settlement in 1925 of the issue of ownership of the oil-rich bed of the Red River which changed its course and was claimed by Texas, Oklahoma, Indian tribes, and the United States Government.)

THE GEODETIC SURVEY OF CANADA. Symposium of four papers. *The Canadian Surveyor,* Vol. 14, No. 6, January 1959. (Papers on the subjects of precise leveling, triangulation, astronomy, base lines, and electronics presented at a meeting of the Ottawa Branch of the Canadian Institute of Surveying.)

A PROFESSIONAL OUTLOOK. Prof. Mervyn Woods. *The Canadian Surveyor,* Vol. 14, No. 6, January 1959. (Address by a professor of law to the Association of Professional Engineers of Saskatchewan and the Engineering Institute of Canada, January 1958.)

A NOTE ON NATHANIEL BOWDITCH. (From Saugatuck River Squadron's "DREDGINGS.") *The Ensign,* Official Publication of the United States Power Squadrons, Vol. 47, No. 1, January 1959. (Sidelights on the father of the "American Practical Navigator.")

SIMULTANEOUS DETERMINATION OF LATITUDE, AZIMUTH AND TIME BY OBSERVATION TO A PAIR OF STARS. V. N. S. Murthy. *Empire Survey Review,* Vol. 15, No. 111, January 1959. (Description of method of field observations and of reduction of observations with an example of the operation.)

PUBLIC LANDS COMMITTEE FORMED. Murray E. Morgan. *New Mexico Magazine,* Vol. 37, No. 1, January 1959. (Report of new organization formed at Los Angeles Meeting of the Council of State Governments to study problems of ultimate disposal of public lands in western States.)

ADVENTURE AT DENALI. Leonard M. Berlin. *Our Public Lands,* Vol. 8, No. 3, January 1959. (An account of experiences of BLM surveyors marking boundaries of Mt. McKinley National Park.)

ANNOUNCEMENT ON THE INTERNATIONAL YARD AND POUND. (No author given.) *Technical News Bulletin, National Bureau of Standards,* Vol. 43, No. 1, January 1959. (Same issue includes "Background and Use of the International Yard and Pound" and "Report on 1958 Meeting of the International Committee on Weights and Measures.")

NATHANIEL BOWDITCH, MATHEMATICAL WIZARD. (No author named.) *Proceedings of the Merchant Marine Council,* Vol. 16, No. 1, January 1959. (Brief biography accompanying announcement of new edition of the "American Practical Navigator.")

FEDERATION INTERNATIONALE DES GEOMETRES, NEUVIEME CONGRES, SCHEVENINGEN DELFT 1958. *Tijdschrift voor Kadaster en Landmeetkunde,* 74e jaargang, Nr. 4, 1 Aug. 1958. (Papers in English, French, and Dutch on various subjects relating to surveying and mapping.)

APPLICATIONS OF PHOTOGRAMMETRY AT THE AIR FORCE MISSILE TEST CENTER. Robert A. Kelley. *Journal, Florida Engineering Society,* Vol. 12, No. 5, February 1959. (Discussion of the application of photogrammetric techniques to ballistic problems.)

SURVEYING AND MAPPING ACTIVITIES. Jon S. Beazley. *Journal, Florida Engineering Society,* Vol. 12, No. 5, February 1959. (Report on surveying and mapping activity in Florida during 1957 highlighted by enactment by the State Legislature of a Cooperative Mapping Agreement with the U. S. Geological Survey.)

"BOWDITCH." Commander Alton B. Moody, U.S.N.R. *Nautical Hagazine* (London), Vol. 181, No. 2, February 1959. (An account of the origin and evolution of the famous "American Practical Navigator" and a description of the new 1958 edition.)

THE INTERNATIONAL (GEOPHYSICAL) YEARS —AN APPRAISAL. N. C. Gerson. *Journal of the Franklin Institute,* Vol. 267, No. 2, February 1959. (Brief comparison of scope and results of the first and second International Polar Years with the International Geophysical Year just completed.)

WHAT NEXT? F. W. Von Meister. *The International Blue Printer,* Vol. 32, No. 2, February 1959. (General discussion of past and future trends in duplicating methods.)

COMPUTERS AND THE ENGINEER PERSONALITY. Elmer K. Timby. *Civil Engineering,* Vol. 29, No. 3, March 1959. (Discusses the human effect on the engineer of the electronic concept of engineering.)

NEW ST. LAWRENCE SEAWAY OPENS THE GREAT LAKES TO THE WORLD. Andrew H. Brown. *The National Geographic Magazine,* Vol. 115, No. 3, March 1959. (In addition to general description of project, comments on surveying and engineering problems during construction.)

Cartography

FREEWAY MODEL. Warren S. Ludlow. *California Highways and Public Works,* Vol. 37, Nos. 11–12, November–December 1958. (Describes construction of a 1″ to 50′ scale model to aid in the design of the very complex East Los Angeles Freeway Interchange.)

ALASKA: MAP RESOURCES OF THE 49TH STATE. Jeannette Stewart. *Special Libraries Association, Geography and Map Division, Bulletin No. 34,* December 1958. (Entire edition of the Bulletin is largely devoted to Alaska and includes "Selected Bibliography of Alaskan Mapping" by George R. Dalphin, and "Some Recent and Standard Maps, Alaska" by Charles W. Buffum and George R. Dalphin.)

HISTORICAL CHAMPLAIN MAPS. John C. Huden. *Vermont History,* N. s. Vol. 27, No. 1, January 1959. (Historical discussion accompanied by maps.)

MAP PAPERS WITH SYNTHETIC FIBERS. (No author named.) *Modern Lithography,* Vol. 27, No. 1, January 1959. (Describes an evaluation by the Bureau of Standards for the Army Engineer Research and Development Laboratories.)

EXPERIMENTAL MAP PAPERS CONTAINING SYNTHETIC FIBERS. (No author named.) *Technical News Bulletin, National Bureau of Standards,* Vol. 43, No. 1, January 1959. (Includes more detailed report of experiments performed in connection with the evaluation made for the Army Engineers mentioned in the above article in Modern Lithography.)

ELECTRONIC AIDS TO NAVIGATION. Lt. Comdr. R. T. Norris, USCG. *Proceedings of the Merchant Marine Council,* Vol. 16, No. 1, January 1959. (Describes systems now in use by the United States and foreign countries.)

NEW WILLIAMS & HEINTZ PLANT, Michael J. Geary. *Modern Lithography,* Vol. 27, No. 3, March 1959. (An account of the design and construction of the new modern printing plant of a firm which does a large amount of map work.)

Control Surveys

SIMULTANEOUS ADJUSTMENT OF LENGTHS AND ANGLES IN A TRIANGULATION SCHEME. L. A. Gale. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Mathematical discussion of method.)

THE USE OF PHOTOGRAMMETRIC SURVEYS FOR HIGHWAY LOCATION. George J. Smith. *The*

Canadian Surveyor, Vol. 14, No. 6, January 1959. (Suggestions on laying out route location by aerial photography.)

PRECISE BAROMETRIC LEVELLING IN NORTHERN QUEBEC WITH THE HELP OF HELICOPTERS. Louis Laflamme. *The Canadian Surveyor,* Vol. 14, No. 6, January 1959. (Second of two papers on the same subject presented to the Montreal Branch of the Canadian Institute of Surveying.)

GROUND EFFECTS IN PRECISE RADIO DISTANCE MEASUREMENTS. A. G. Mungall. *The Canadian Surveyor,* Vol. 14, No. 6, January 1959. (Describes ground effects encountered in the precise measurement of distances using the Tellurometer principle.)

ELECTRIC ANALOGUE FOR TRIANGULATION ADJUSTMENT. Hsuan-Loh Su. *Empire Survey Review,* Vol. 15, No. 111, January 1959. (Part 1. Discussion of problems involving angles only.)

TRIANGULATION BY THE DIRECTION METHOD. A. P. Atkinson. *Empire Survey Review,* Vol. 15, No. 111, January 1959. (Conclusion of an article reported in last issue.)

REMARKS ON THE LEAST SQUARES ADJUSTMENT OF LINEAR DIMENSIONS IN A GEODETIC QUADRILATERAL. A. Tarczy-Hornoch. *Empire Survey Review,* Vol. 15, No. 111, January 1959. (Mathematical demonstration.)

EARTH OBLATENESS IN TERMS OF SATELLITE ORBITAL PERIODS. Leon Blitzer. *Science,* Vol. 129, No. 3345, February 6, 1959. (Describes use of Vanguard data to obtain a check calculation for the oblateness of the Earth and to establish the validity of the method employed.)

HYDROGRAPHIC SURVEYING FROM A HELICOPTER. James W. Poirot. *Civil Engineering,* Vol. 29, No. 2, February 1959. (Describes novel method of obtaining necessary surveys in connection with a coastal engineering project.)

MEAN SEA LEVEL VARIATION ON THE COAST OF NEW SOUTH WALES. B. V. Hamon. *The Australian Surveyor,* Vol. 17, No. 3, September 1958. (Extended discussion with tables and diagrams.)

MODERN TECHNIQUES OF AIR SURVEY. Desmond O'Connor. *The Australian Surveyor,* Vol. 17, No. 3, September 1958. (Discussion with particular reference to electronic methods of position fixing.)

TRIALS OF THE TELLUROMETER CARRIED OUT JOINTLY BY THE ORDNANCE SURVEY OF GREAT BRITAIN AND THE SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH. J. Kelsey and R. S. A. Edge. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Paper presented at Toronto General Assembly 1957 describing tests and including references to other literature on the instrument.)

DETERMINATION OF LAPLACE AZIMUTHS BETWEEN NON-INTERVISIBLE DISTANT STATIONS BY PARACHUTED FLARES AND LIGHT CROSSINGS. E. M. Sodano. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Paper presented at Toronto General Assembly, 1957, and including formulas for methods used.)

USE IN GEODESY OF THE RESULTS OF LUNAR OBSERVATIONS AND EVENTUAL OBSERVATIONS OF ARTIFICIAL SATELLITES. W. Markowitz. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Report of special study group presented at Toronto General Assembly, 1957.)

ON THE GEODETIC APPLICATION OF A SOLAR ECLIPSE. O. Mattingly and F. J. Heyden. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Discussion of some phases of the problem not readily available in literature presented at the Toronto General Assembly, 1957.)

THE IGY OPTICAL SATELLITE TRACKING PROGRAM AS A SOURCE OF GEODETIC INFORMATION. F. L. Whipple and J. A. Hynek. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Résumé of program presented at Toronto General Assembly, 1957.)

GEOCENTRIC COORDINATES FROM LUNAR AND SATELLITE OBSERVATIONS. W. Markowitz. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Mathematical discussion of use of data derived from observations.)

THE OCCULATION METHOD OF LONG LINE MEASUREMENTS. J. A. O'Keefe. *Bulletin Géodésique* (Journal of the International Association of Geodesy), Nouvelle Série, Année 1958, No. 49, Ier Septembre 1958. (Description of method and equipment used presented to Toronto General Assembly, 1957).

Education

THE STATUS QUO OF MATH AND SCIENCE IN THE HIGH SCHOOL. Lenwood Padgett. *North Carolina Engineer,* Vol. 15, No. 2, January 1959. (Blames several circumstances for weak condition —including overemphasis on athletics.)

Instruments

A NEW PRECISION ALTIMETER. Gilbert Hobrough. *The Canadian Surveyor,* Vol. 15, No. 5, October 1958. (Illustrated description of hypsometer type of altimeter.)

ELECTRONIC CORRELATION OF IMAGE DETAIL IN THE STEREO MODEL. R. W. Hutchins. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Description of the Automatic Scanning Correlator).

TWO NEW SELF-ALIGNING LEVELS. F. B. R. Hogg and J. A. Armstrong. *Empire Survey Review,* Vol. 15, No. 111, January 1959. (Illustrated description of design and structure of two different instruments each embodying identical stabilizing or compensating units and telescope optics.)

TELEMETRY. Sterling Fisher. *Journal, Florida Engineering Society,* Vol. 12, No. 5, February 1959. (General discussion of the application of telemetry to guided missile experimentation.)

Property Surveys

SURVEYS ON THE ST. LAWRENCE POWER PROJECT. W. H. Williams. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Extended description of cadastral, control, and topographic surveys needed for project.)

THE LAND SURVEYOR IN NOVA SCOTIA. J. A. H. Church. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Review of somewhat confused local conditions due to inadequate land legislation system.)

SURVEYS AND PLANS UNDER THE LAND TITLES ACT IN ONTARIO. W. M. Magwood. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958. (Includes excerpts from recent amendments to land titles act.)

WHAT ABOUT LAND LOCATORS? *Our Public Lands,* Vol. 8, No. 3, January 1959. (Advisory from Bureau of Land Management.)

HOW WE ACQUIRED OUR LANDED ESTATE—PART I. Karl S. Landstrom. *Our Public Lands,* Vol. 8, No. 3, January 1959. (Historical facts on the acquisition of the United States public domain.)

FUNDAMENTAL RULES AND PRINCIPLES OF SURVEYING. W. F. Roberts. *The Canadian Surveyor,* Vol. 14, No. 6, January 1959. (Discussion of fundamental principles and rules for guidance in retracement surveys.)

THE LAND TITLES ACT. Compiled by W. M. Magwood. *The Canadian Surveyor,* Vol. 14, No. 6, January 1959. (Continuation of a presentation begun in the previous issue.)

Topography

PRECISE BAROMETRIC LEVELLING IN NORTHERN QUEBEC USING HELICOPTERS FOR TRANSPORTATION. M. S. Slivitzky. *The Canadian Surveyor,* Vol. 14, No. 5, October 1958 (An account of methods employed.)

TOPOGRAPHIC MAP DRAWING. W. J. Sear. *The Australian Surveyor,* Vol. 17, No. 4, December 1958. (Comprehensive illustrated discussion of all phases of the subject.)

PHOTOGRAMMETRIC MAPPING OF HIGH BLUFFS. Claude W. Waggoner. *Civil Engineering,* Vol. 28, No. 12, December 1958. (Describes difficulty of mapping certain terrain in projects within the Walla Walla Engineer District and advantages and savings by using first-order high precision plotting equipment.)

PHOTOGRAMMETRIC MAPPING. J. J. Ovington. *The Australian Surveyor,* Vol. 17, No. 4, December 1958. (General discussion of the topic with diagrams and formulae.)

BOOKS AND PAMPHLETS

ANNUAL REPORT, CANADIAN INSTITUTE OF SURVEYING, 1958. *The Canadian Surveyor,* Vol. 14, No. 4. (Occupies entire issue and includes list of members.)

THE MISSOURI, WATER AND LAND DEVELOPMENT FOR THE NATION. Missouri Basin Interagency Committee. Issued by the U. S. Department of Health, Education, and Welfare, Public Health Service Publication No. 904 (1958). Superintendent of Documents, U. S. Government Printing Office, 55 cents. Illustrated, 1 map.

INSTRUMENTS OF NAVIGATION. A catalogue of instruments at the National Maritime Museum, Greenwich, with notes upon their use. H. O. Hill and E. W. Paget-Tomlinson. London, H. M. Stationery Office 1958. 89 pp.

SPECIFICATIONS FOR FIELD CLASSIFICATION SURVEY FOR MEDIUM SCALE MAPPING. Edition 2. AMS 1958. Washington 1958. 81 pp. (AMS Technical Manual No. 73.)

PROCEEDINGS, 37TH ANNUAL MEETING, NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS, MILWAUKEE, WISCONSIN, August 21–23, 1958. Year book, 1958–59. 213 pp., illus. $2.00. (Executive Secretary T. Keith Legare, Palmetto State Life Building, P. O. Drawer 1404, Columbia, South Carolina.)

KNOW FLORIDA; A NARRATIVE AND GRAPHIC GUIDE TO THE SIXTY-SEVEN COUNTIES OF THE STATE. Florida, Department of Agriculture, Tallahassee, 1958. 203 pp.

SOUTH CAROLINA, ROSTER OF REGISTERED PROFESSIONAL ENGINEERS AND LAND SURVEYORS, SEPTEMBER 1958. Columbia, 1958. 106 pp.

THE KLONDIKE FEVER: THE LIFE AND DEATH OF THE LAST GREAT GOLD RUSH. Pierre Berton. *Alfred A. Knopf,* New York, 1958. xix and 457 pp., maps.

CANADIAN MAPS 1955–1956. Canada, De-

partment of Mines and Technical Surveys, Geographic Branch. Ottawa, Canada, 1958, 75 cents. 40 pp. (Bibliographical Series No. 21.)

1958 Annual Report, Secretary of the Interior. Fred A. Seaton. U. S. Government Printing Office, Washington 25, D. C., 1958. xliv and 403 pp., illus., $1.50. (Subtitle: Sound Use of our Natural Resources.)

Final Report of the Commission for the Study of a Uniform Map Law. (Raleigh) September 1958, 21 pp. (Topics covered: Official Survey Base; Testing of Surveying Instruments; Control Corners in Real Estate Development; Preparation and Recording of Maps; Registration and Practice of Land Surveying; County Surveyors; Summary. Annexes A-F quote statutes pertaining to the study.)

Automation Bibliography. 1958. National Office Management Association, 1931 Old York Road, Willow Grove, Pennsylvania. $2.00.

Glossary of Automation Terms. National Office Management Association, 1931 Old York Road, Willow Grove, Pennsylvania. 38 pp. $2.00.

The American Ephemeris and Nautical Almanac for the Year 1960. U. S. Nautical Almanac Office. Washington, Government Printing Office, 1958. 533 pp.

St. Lawrence Seaway & Power Projects. 1959. Montreal, *Reid and Boulton Publishing Company*. 413 pp., maps.

California, Roster, Civil and Professional Engineers and Surveyors, 1958–59. Board of Registration for Civil and Professional Engineers, Sacramento, Dept. of Professional Standards, 1958. 458 pp., $1.04.

Indiana, Board of Registration for Professional Engineers and Land Surveyors, 36th Annual Report for the Year Ending June 1957. (Includes copy of registration law, rules of the Board, and roster of registered engineers and land surveyors for the year ending July 31, 1958.) Indianapolis, Bureau of Public Print, 1958. 145 pp., illus.

—Lyman D. Lynn

Coast and Geodetic Survey

A.S.P. Monthly News Letter

Vol. I, No. 1, (December 1958) of the *A.S.P. Monthly News Letter*, a 4-page, mimeographed publication has made its appearance, and the aims and purposes of the new sheet are set forth in the following quotation from page one:

"The Monthly News Letter is a new publication of the American Society of Photogrammetry. It is felt that this means of publishing the information formerly contained in the Journal News Notes, Resolving Power, and Region News would be more timely and less expense to the Society. Each Region has been asked to send in items of interest on a regular basis, possibly through the appointment of a regional reporter.

"The program of the annual meeting will be published in the Monthly News Letter as well as dues notices, nominations for office, and general information concerning the Society.

"The Publications Committee hopes to make this New Letter an important adjunct of the Society's operations and will welcome any comments or suggestions from the members of the Society."

Skindivers Check Current Meters

Skindiving oceanographers have for the first time made a direct underwater check on the operation of the automatic meters that send radio reports of coastal currents. Three meters inspected in about 15 feet of water at Little Creek, Va., at the mouth of Chesapeake Bay, were found to be transmitting accurate data on the direction of the currents.

The diving was done from the survey ship *Gilbert* on April 2 and 3, 1959, by three scientists from the Division of Tides and Currents of the Coast and Geodetic Survey: Dr. Harris B. Stewart, Jr., Garrett G. Salsman, and Ronald K. Reed.

Three Roberts Radio Current Meters were in regular operation, suspended from large buoys, one in the entrance to Little Creek and two outside. The divers wore wrist compasses and carried bottles of brilliant yellow-green dye, as well as plastic slates on which they could write under water with pencils.

Releasing the dye so they could see the direction of flow, they made notes on the slates. Back aboard ship, they compared their records with those made on the recording tape by the automatic radio reports from the buoys. The directions checked in each case. No attempt was made to check the velocity.

Distinctive Recent Maps

Few libraries or private collectors are able to acquire originals of some of the rare manuscript or printed maps which are records of the historical past as well as milestones of cartographic development. It is always welcome news, therefore, when facsimiles of such significant maps are published.

A recent addition to the growing list of fine cartographic reproductions is a facsimile of the manuscript map of Great Britain, c. 1360, known as *The Gough Map*.

The collotype reproduction, in seven colors and gold, was made by the Oxford University Press. The facsimile is in two sheets, each measuring 23½ by 25½ inches. It is accompanied by two transparent overlays, one giving place names on the Gough Map and the other giving their positions on a modern map. Also available with the map is a booklet, describing the history and contents of the map, prepared by E. J. S. Parsons, Superintendent of the Bodleian Library's Map Section.

The Gough Map is one of the outstanding treasures of the Bodleian Library. It is the earliest road map of Great Britain and distances shown on the map compare favorably with those used on maps 300 years later. The facsimile is a joint publication of the Bodleian Library and the Royal Geographical Society (Kensington Gore, London S. W. 7), and copies may be ordered from either institution. The price is listed as £2. 10s., plus postage.

The *Europe* and *Northeastern Africa* sheets of the 1:5,000,000 World Map, in preparation by the American Geographical Society for the Army Map Service, were received recently. The former measures 43 by 40 inches and the latter 38 by 39 inches. Generalized relief is shown on both maps by contour lines. The Europe sheet includes all of Europe, extending eastward beyond the Ural Mountains, as well as Iceland, and the lands bordering the Mediterranean Sea. The Northeastern Africa sheet embraces, in addition to that region, all of the Middle East, the Arabian Peninsula, and southern Iran.

A joint achievement of the Army Corps of Engineers, Tennessee Valley Authority, and the Department of the Interior's Bureau of Reclamation is the *United States Water Resource Development* map, published in September 1958. The map, which is at the scale of 1:2,500,000, includes projects of the above-mentioned agencies involving almost three billion dollars in Federal funds. There are inset maps of Alaska, Puerto Rico, Hawaiian Islands, and of the U. S. showing major drainage areas. The two sheet map (each sheet 50 by 41 inches) is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Geo-Physical Maps, Inc., of New York City, producers of the popular Geo-Physical Relief Work Globe, has recently introduced a series of *Raised Relief Maps of the United States*. The maps, at the approximate scale of 1:6,750,000 and measuring 20 by 30 inches, are printed and pressure-formed on a plastic-coated, flexible base. The surface is washable and will take washable crayons or liquid tempera colors. The United States map is available with (a) relief only, (b) relief, plus State boundaries, and (c) relief, plus State boundaries and State and city names. The price for each style is three dollars. The Raised Relief Maps, as well as the Geo-Physical Relief Work Globe, are distributed by Bro-Dart Industries, 56 Earl Street, Newark 5, New Jersey.

The elevation of Alaska to statehood has cartographical as well as political significance. Official, private, and commercial mapmakers are, therefore, rushing through the presses maps of the forty-ninth State. Several which have been received are here noted.

Alaska Oil & Gas Wells was copyrighted early in 1959 by The Alaska Scouting Service, P. O. Box 2278, Anchorage, Alaska. Ownership data for some 55 wells are tabulated on the sheet margin. The map, which is uncolored, is at the scale of 1:3,000,000 and measures approximately 28 by 34 inches.

The 49th State of the United States is the title of a map and pictorial folder issued by Alaska Cruise Lines, Ltd., Seattle, Washington. It was copyrighted in September, 1958 by Hagan and Young, also of Seattle. The map includes all of the Pacific Coast extending from the Aleutians to Oregon. It shows the major highways within the new State as well as the Alaska, Haines, Hart, and Cariboo Highways.

Ernest Dudley Chase of Westwood, Massachusetts, well-known cartographic illustrator, has designed and drawn a *Pictorial Map of Alaska the 49th State*. This uncolored map includes many small, well-executed sketches illustrative of scenic, historic, or economic centers of interest. It measures 21 by 27 inches and the scale is 1:8,500,000.

The first sheet (Death Valley) of a new *Geologic Map of California* at the scale of 1:250,000 has been received. It is a publication of California's Division of Mines, Department of Natural Resources, Ferry Building, San Francisco. An accompanying sheet gives the stratigraphic nom-

enclature of the Death Valley Sheet, includes several illustrations of the landscape, and lists 21 references on the geology of the area. The map shows formations ranging from pre-Cambrian to Quaternary.

Mineral Resources and Mineral Industries of West Virginia is a 1958 compilation and publication of the West Virginia Geological and Economic Survey, Morgantown. The scale is 1:500,000 and the size is 34 by 37 inches. The emphasis is on the State's primary resources, coal, natural gas, and petroleum, but also shown are deposits of limestone, sandstone, glass sand, clay and salt.

What do geographers and cartographers do after they retire? Some of them apparently make maps, we are pleased to learn. A recent mail brought a *Perspective Sketch Map of the Mt. Cube Area, New Hampshire-Vermont,* compiled and drawn by Dr. John K. Wright, former Director of the American Geographical Society, and originator of the "Distinctive Recent Maps" feature (*see* "Maps of Distinction," SURVEYING AND MAPPING, October–December 1958, page 445).

"Here, with my compliments," wrote Dr. Wright in the letter which came with the map, "is a 'Distinctive Map' which I made for my own and my neighbors' amusement. It shows that I should first have taken some lessons in block-diagram drawing from somebody like Raisz before venturing on anything so rash."

The perspective map is based on the Mt. Cube topographic quadrangle published by the U. S. Geological Survey. It is at the scale of 1:100,000 and measures 9½ by 13 inches. Villages, water features, and hills and mountains are listed and keyed to proper locations on the map. Dr. Wright has "retired" to Lyme, N. H., where he continues an active and productive program of research and writing.

Principal Power Facilities of the Hydro-Electric Power Commission of Ontario and Municipal Systems Served are shown on a large map (47 by 65 inches, scale 1:1,000,000) by the Province of Ontario Power Commission. There is an enlarged inset map of the "Toronto, Hamilton and Niagara Area" and an "Index of Commission Owned Stations and Municipal Systems Served."

Canada's Department of Northern Affairs and National Resources, Forestry Branch, published in 1958 a *Map Showing Pulp and Paper Industry of Canada.* It locates pulp mills, pulp and paper mills, and paper mills. Tables, printed on the map margins, give the names and adresses of the various mills, by Provinces. The approximate scale is 1:6,500,000 and the measurements are 24 by 34 inches.

Finland's transportation network is presented on *Rautateiden Kuljetusverkko,* a map published in 1958 by Maanmittaushallituksen Kivipaino, Helsinki, Finland. It measures 35 by 28 inches and is at the approximate scale of 1:1,000,000. There are insets for the regions adjacent to Helsinki, Imatra, and Kotka.

Pre-Quaternary Rocks of Sweden are mapped, at the scale of 1:1,000,000, by Sveriges Geologiska Undersökning. The map was published in 1958, by A B Kartografiska Institutet, Esselte Ab Stockholm. It is printed on three sheets (21 by 20½ inches), each folded in separate covers. The map may be ordered from Generalstabens Litografiska Anstalt Forlag, Stockholm 16, Sweden.

Mapa Polski is a 1958 publication of Panstwowe Przedsiebiorstwo Wydawnictw Kartograficznych, Warsaw. It portrays the administrative divisions and cultural features of Poland at the scale of 1:500,000. The map is printed on four sheets, each of which measures 28 by 31½ inches. A small inset map shows population densities by districts. An index of names (149 pages) accompanies the map.

Climatic subdivisions of Spain, Portugal, and the coastal region of northwest Africa are presented in a map entitled *Sous-Regions Climatiques de la Peninsule Iberique.* It was compiled by Prof. Henri Gaussen of the University of Toulouse, with the collaboration of F. Bagnouls and P. Dupont. Cartography is by A. Rinaldo. The map measures 19½ by 20½ inches and is at the scale of 1:4,000,000. "Warm and Moderately Warm Climates" are subdivided into Desert, Subdesert, Xerothermomediterranean, Thermomediterranean, Mesomediterranean, Submediterranean, and Hypomésarérique. Subdivisions of "Cold and Moderately Cold Climates" the Oroxérotherique and three categories of cold Axerique.

Spain's electric power centers and network are shown on the *Mapa de las Instalaciones de Produccion, Transporte y Subestaciones de Transformaciones de Energia Electrica,* published, in 1958, by Direccion General de Industria, Ministerio de Industria [Madrid]. The data on electric energy are superimposed upon a base map which shows relief by contour lines. The map measures 35 by 48 inches and is at the approximate scale of 1:1,200,000.

Afrique Equatoriale Française Esquisse Ethnique Générale maps the ethnographical groups of French Equatorial Africa. The map, at the scale of 1:5,000,000, was published in 1957 by Ministère des Travaux Publics et des Transports, Institut Geographique National, 136bis Rue de Grenelle, Paris. Twenty-five different groups are shown by color symbols. The map was compiled under the direction of Marcel Soret.

South Africa, Normal Annual Rainfall presents the generalized pattern of precipitation distribution for that Dominion. The map was compiled in the Climatology Branch, Weather Bureau, Pretoria, and published in 1957 by the Gov-

ernment Printer, Union of South Africa. The scale is 1:2,500,000 and the size 33 by 41 inches.

Some interesting new cartographic techniques are presented in several recent maps published by Great Britain's Directorate of Overseas Surveys (Surbiton, Surrey). The first sheets of the 1:100,000 topographic map of *Aden Protectorate* show a radical reparture from traditional methods of relief representation. Based upon aerial photography, the three-dimensional relief of this steeply dissected desert plateau is portrayed by photographing controlled mosaics of aerial photographs (taken from a high altitude) through a half-tone screen. An orange-buff-brown range of colors is used to show the features in this arid region, and water courses are indicated in an unorthodox greenish-blue. Eight sheets of the *Aden Protectorate* map were included in the initial distribution.

The one-sheet map of *South Georgia* comprises part of the survey of the Falkland Island Dependencies, at the scale of 1:200,000, carried out between 1951 and 1957. "Although compiled entirely from ground surveys, [the South Georgia map] may be considered, cartographically, the forerunner of sheets in the 1:200,000 Graham Land (Palmer Land) series based on air photography with limited ground control." The latter is scheduled for 1959 publication.

Symbols and conventional signs have been kept small on the South Georgia sheet in order to present a maximum of information without overloading the map. Relief is shown with brown contours on land features and with blue contours on glaciers.

The land use of Gambia, at the scale of 1:25,000, is presented in another new map published by the Directorate of Overseas Surveys. The first four sheets, of a projected thirty-five, have been received. Land use and vegetation information is shown by appropriate colors overprinted on a grey topographic base. R.A.F. air photographs, supplemented by additional photography made in 1956, were used in compiling the land use map.

A generalized picture of the economic resources of the Middle East is presented on a map entitled *Moyen-Orient Essai de Carte Economique.* It was published, in 1958, as map No. 79 in the series compiled by France's Direction Général du Gouvernement, Direction de la Documentation. Colors show the extent of the several predominant types of land use and symbols locate underground resources and industries. The map measures 29 by 35 inches and is at the scale of 1:5,000,000. There is an enlarged inset map of the coastal areas of Israel, Lebanon, and Syria, and a small inset showing the petroleum centers of the Middle East. Printer of the map is Institut Geographique National of Paris.

Yutaka Kamashita is the compiler of a new *General Map of Soil Types in Japan,* at the scale of 1:800,000. It was published in 1957 by the National Institute of Agricultural Sciences, Tokyo, and printed by Maigai Chizu Co., Ltd., 1–4 Kandanishikicho, Chiyoda-Ku, Tokyo, Japan. The map, which is printed on three sheets, shows the distribution of 14 different groups, as well as large sections classed as "mountain soil."

Activities and explorations related to the International Geophysical Year have added to the geographical knowledge of the south polar regions. The map of Antarctica is, therefore, subject to almost continuous revision. An authoritative, accurate, and up-to-date summary of the geography of the continent is presented in the revised edition (Oct. 1958) of the map of *Antarctica* prepared by the American Geographical Society for the National Academy of Science. Lithography is by A. Hoen & Company, Baltimore.

Data for the map were supplied by the U. S. National Committee, International Geophysical Year. The map, which is on the stereographic projection, measures 40 by 40 inches and is at the scale of 1:6,000,000. Relief in explored areas is shown by contours, form lines, and spot elevations. There are small insets of "Antarctica in Relation to the Other Continents," "Mapping the Antarctica as of October 1958," and "United States and Antarctica."

The route followed by Sir Vivian Fuchs is traced on the *Map of the Trans-Antarctic Expedition 1957–58,* published by the London *Times.* Also shown are expedition and I.G.Y. bases, and the boundaries of territorial claims. The map measures 21 by 31 inches and is at the scale of 1:12,000,000. Portraits of Fuchs, Sir Edmund Hillary, and other members of the expedition fill the marginal spaces of the sheet.

WALTER W. RISTOW
Library of Congress

"Private Practice of Civil Engineering"

The American Society of Civil Engineers has issued No. 38 of its Manuals of Engineering Practice. The full title is "Private Practice of Civil Engineering—for the Use of Engineers and Clients."

Approved by the Board of Direction of A.S.C.E., on October 14, 1958, this manual has been published with a 1959 date. It contains information on engineer-client relationships and is available from the American Society of Civil Engineers, 33 West 39th Street, New York 18, N. Y., for $1.00 (50% discount to members of A.S.C.E.).

The Surveyor and the Law

The Surveyor Witness in a Boundary Suit

By H. P. MITCHELL

HUMBLE OIL & REFINING COMPANY, TYLER, TEXAS

THERE IS no definite means at my disposal to determine the extent to which any of you have participated in boundary lawsuits. Furthermore, I realize that perhaps not all of those present are surveyors. Yet this paper will be directly and exclusively concerned with the surveyor as a witness in a boundary suit. Therefore, is is very important to bring into focus the *object* of a boundary suit.

Attorney Carlton R. Winn, Dallas, Texas, has very adequately interpreted the real meaning of a boundary suit by stating: "The object and purpose of a boundary suit is to reproduce the story surrounding the original location of a tract of land, to take the broken pieces and put together the jigsaw puzzle so that the original tract of land is reproduced as it was in the original location."[1] It becomes immediately apparent that as land surveyors and, more important, Registered Public Surveyors of Texas, we play a very vital and key role in helping the courts of the State to reach this stated objective.

It has been my observation that insofar as boundary lawsuits are concerned, surveyors have two, perhaps three, viewpoints. Some of the surveyors of my acquaintance are not really interested in boundary litigation, and "dodge" the witness stand if they can. A second group is willing to make surveys which could result in litigation. Then, when the case is tried before the court they prefer to call in a more experienced surveyor to present the testimony affecting disputed boundaries. The third group, limited in number, have through the years acquired a vast amount of experience, because they have been willing to shoulder the responsibility and the unusual amount of work necessary for proper preparation as a surveyor witness, and have the courage to serve the profession well. From a fee standpoint I need not state which group has fared the best. While we recognize that fees are important, and must necessarily be a major concern of everyone, yet I am convinced that the interest of the latter group has gone far beyond the money directly involved. Through their willingness to gain courtroom experience and literally lift the entire profession to higher standards, we have the registration law, which has already benefited the entire profession of surveying in Texas and will through the years continue to bring added prestige to each of us.

During the course of this paper I shall refer to some of my own experiences, as well as some of the methods employed by the company for which I work. It is not to be implied that the same methods or even the same manner of preparing to testify as a surveyor in other boundary suits would be the correct approach. Just as each lawsuit is different, so must be the procedures and the preparation. As a rule, with the exception of the judge and the lawyers, participants in a lawsuit are faced with a situation outside the scope of their daily routine. Courtroom rules are strict and sometimes complicated. Since testifying is not to most of us an everyday business, tension can build and we "tighten up." This is probably caused by the fear that we will do something wrong—make inaccurate statements or frame answers to questions which might be misunderstood by the jury. The basic truth is that we realize the importance of our testimony to the case. The tension builds because we can never be entirely certain that all eventualities have been considered. If these conclusions are well founded, we can readily see how those of us with limited experience can be overshadowed by those in our profession who have prepared themselves both from a standpoint of experience and study. I do not wish to be misunderstood. I am certainly not advocating that as surveyors we should attempt to make our living in the courtroom. I am ad-

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Presented at the meeting of the Central Texas Chapter of the Texas Surveyors Association, Lufkin, Texas, September 4, 1958.

[1] "The Preparation and Trial of a Boundary Suit," by Carlton R. Winn. Second Annual Surveyors Association Short Course, October 1953.

vocating that we face squarely the problems and responsibilities of being able, through experience, to qualify adequately as expert witnesses, thereby serving our clients in the best possible manner.

Many factors must be considered in arriving at the value and purpose of the surveyor's testimony. Perhaps chief of these is that he must realize that points which are important to him and influence his thinking could make very little impression on the jury unless strongly presented and stressed. From year to year we re-establish a great number of land boundary lines. These lines are like fingerprints because none are exactly alike. Therefore, the challenge is constant and must be met each time we attempt to locate a line, either in the office or in the field. While part of the fascination of the work is centered around this constant challenge, past experience indicates that we sometimes treat boundary placements as routine. Rarely do we as surveyors go back on the ground because of a lawsuit that we do not find additional information.

We know that nearly all tracts are described by field notes. We know equally well that many tracts are difficult to locate from their field note descriptions. Witness trees vanish; fence lines are changed; and only the old timers have knowledge, often hazy, as to the true location of many boundary lines. We know that once a line is run by a surveyor, the line remains, though it cannot be seen, or heard, or felt.[2] Therefore, much importance is attached to the testimony of the surveyor regarding actual ground conditions, especially as they relate to the original location of disputed boundaries. The surveyor witness must know and present the facts. He cannot, if he expects his testimony to be credible, build any case around a network of sloppy field work. half truths, and innuendoes. His must be a thorough, conscientious effort in which all avenues are searched and the best and most logical answers to all questions found. Also, he must consider the present case in the light of past work, methods of construction used in past work as related to the present case, and papers which perhaps he has written that could cause him concern during the trial of a particular suit. He must cooperate to the fullest extent with his counsel or trial lawyers, not only in the preparation of all the exhibits but the manner of presenting his testimony with the greatest effectiveness. He will find his counsel will help him with the fine points of courtroom technique, make his testimony more effective, and at the same time guide him through the soft spots and around the pitfalls. The surveyor witness in a boundary suit is not expected to be completely familiar with courtroom procedure and rules. These are the attorney's concern; yet many of them apply to the surveyor, and he should have a basic knowledge of them in order to present his testimony more forcefully. During the course of most boundary litigation much is heard in the court about rules of evidence, sequestration of witnesses, qualification rules, hearsay testimony, legal rules, etc., each of which has been covered by an excellent article prepared by one of the State's more eminent land boundary lawyers, Wayland Sanford, Dallas, Texas. In his paper, "The Surveyor in Court,"[3] Mr. Sanford discussed completely these phases of a boundary suit. For emphasis, three major points have been taken from Mr. Sanford's paper. These are:

"The law of Texas is not the subject of testimony in a Texas court. The jury must receive the law only from the court—not from the witness."

The second is:

"The surveyor witness is an expert witness only within a limited field. In general, the opinions he can express as an expert are limited to such as are incident to explaining what he did and found on the ground. On account of his special skill, training, and experience, he can testify as to what is or is not accepted surveying practice. And he can testify that he did his work in accordance with accepted surveying practice, but he cannot stretch that into an opinion about the proper location of a lost line by testifying that he actually located the line in question according to accepted methods of surveying. The question of how and where a survey line should be located is a mixed question of law and fact, because it involves the application of legal rules to the known facts, and that is the sort of thing about which no witness, however expert, can express an opinion."

The third point is with reference to visual exhibits and states, in part:

There is not much danger of overdoing visual demonstration in a boundary case where it relates to matters of importance and not to minor incidentals. Since the surveying witness is

[2] "Boundary Litigation in East Texas," by Jesse J. Lee. Fifth Annual Surveyors Association Short Course, October 1956.

[3] "Surveyor in Court," by Wayland Sanford. Fourth Annual Surveyors Association Short Course, October 1955.

permitted to show on his map his construction of lines and corners, he is entitled to take full advantage of the opportunity to do so impressively and even dramatically. Important lines and corners should be emphasized with wide lines and circles, easy to see from the judge's bench and the jury box. Points on the map to which the witness makes particular reference in his testimony should be identified by letters or numbers big enough to be read by the court and jury."

Each of these points deserves your careful consideration.

As a matter of course during the pretrial preparation of a boundary suit, the surveyor and his lawyer will go over the case and the facts time after time. During the actual court trial, in all probability the surveyor witness will be interrupted repeatedly by the opposing counsel objecting to the testimony, to the manner of questioning, etc. Often times objections are raised by the opposition lawyers because the surveyor witness' lawyer asks him leading questions which supply the wanted answer. This is one of the main reasons why I reiterate that is is imperative for the surveyor witness to have all the facts relative to the case well in hand, allowing him to give clear, concise, and factual answers to all questions asked by his counsel, thus bypassing any temptation his lawyer might have to ask the witness leading questions. It is our nature to want to win all the cases in which we testify. I believe you will agree that it is one thing to be prepared and lose, and altogether a different matter to be under-prepared, in which event we will almost certainly have our testimony discredited.

The question could be asked, "How much time should be given to the preparation of a boundary suit on the part of a surveyor witness?" My answer is, "As much time as is necessary to properly prepare the case from every possible angle, taking into consideration every logical and reasonable direction the trial may take." This should, by all means, include preparation on your part from your opponent's point of view in the case. Sometimes it can be profitable to "prepare his case," which will usually strengthen your own. I know of one prominent Texas surveyor involved in a boundary suit of great value who devoted all of his time for six or eight months to field and office preparation. He lost the case; yet to my knowledge he has never been criticized just because he lost. His stature as a surveyor has in no wise diminished. His knowledge of the facts gained the admiration of friend and foe alike—the court simply found the facts to be against his client.

Earlier I referred to exhibits. Frankly, in my opinion, many lawsuits involving land boundaries are won or lost on the exhibits presented by the surveyor. Good exhibits allow the surveyor to bring the tract or line in question right into the courtroom. Therefore, much time and thought should go into their preparation. This is especially true if you go to trial as the defendant in a case. The defendant's exhibits must be very flexible because he does not know the direct course the case will take. In early 1957, I was a surveyor witness in a lawsuit in which we were the defendants. In this particular case we felt we would have to prepare for every eventuality. The shape and size of the tract indicated that exhibits on a large scale would be needed. That this conclusion was well founded was immediately verified when we made an inspection of the District Courtroom where the trial was to be held. This inspection revealed that due to the arrangement of the courtroom, the jury box, and judge's bench, as well as lighting facilities, not only would large exhibits be needed, but were absolutely imperative. We also found that to effectively present our case we would have to make identical exhibits on a much smaller scale for the personal use of the presiding judge. Therefore, the large exhibits were reproduced on a greatly reduced scale. When using a large exhibit on the tack board, the lawyer presented the judge with a reduced duplicate. The effectiveness of such a presentation cannot be underestimated. The plaintiffs' exhibits consisted of a series of overlays, exceptionally well conceived and impressive, which could not be adequately seen by either the judge or the jury. As a result, all parties who were interested inspected the plaintiffs' exhibits during breaks or recesses. Less interested jurors did not; therefore, a great part of their effectiveness was lost. An exhibit that presents a good appearance on the drafting table can be completely inadequate in the courtroom.

The surveyor should do all arguing with his counsel concerning the facts in the case before the trial—not during it. As an expert witness he should stick to direct answers to all questions unless specifically asked to give an opinion or explanation of some specific point. Otherwise, it could be subject to objection. If the lawyer and the surveyor work out the details of a particular case and arrive at a complete understanding as to the nature and direction of the testimony, there is very little reason for any confusion to arise on direct examination. Together

they should be able, with proper exhibits, to give the court and jury a very clear picture of their contentions.

Undoubtedly the most difficult portion of a lawsuit, from the point of view of a surveyor witness, is cross-examination by the opposing lawyers. Usually, in present day trials, each side has several lawyers. Apparently, on cross-examination all want to "get into the act." Consequently, the witness will necessarily have to be prepared for a lengthy session which can best be described as quite an ordeal. Surveyor Wattles in his paper, "The Surveyor in Court,"[4] has made an excellent summation relative to the cross-examination phases of a boundary suit when he states:

"Cross examination by opposing counsel is a difficult phase of the expert's presentation of the testimony. Effort may be made to confuse, discredit or convert the testimony to the interpretation best suited to the opponent's view of the case. To this end, the same question may be repeated several times, rephrased in form, hoping to develop a construable variation and meaning from the various answers. The witness should be alert to this situation and return the same answer to each of the varied forms of the same question. If an answer is long and involved, and in the rephrasing to subsequent questioning there arises the possibility of misconstruction of intendedly synonymous terms, it would be better if reference could be made to the answer previously given as disclosed by the court reporter's notes. In this way the line is clear and there is no confusion.

"Although expert opinion or analysis may be rated hearsay or conclusions of witness in a technical sense, it can be presented as expert testimony without too much danger of objection; but the witness should stay clear of expressions as 'I think,' 'I believe,' 'It seems to me,' and similar ones, for these will most likely bring a sharp 'I object,' or 'Move to strike,' as hearsay or conclusion of witness or no foundation laid, etc. The expert should answer questions by statements which bear the imprint of fact—not conclusion, or by prefacing the answer with 'In my opinion.'

"If a question implying a direct 'yes' or 'no' answer is not so answerable without qualification, so state, and wait for the next question to be more specific."

W. A. (Bill) Rounds has also dealt with cross-examination just as clearly and much more humorously in his "West Texas Surveying Problems."[5] In describing the evolution of a surveyor, Bill gives a vivid picture:

"After our young man has practiced a while, he may be called to take part in a boundary lawsuit. This is a very important step in his evolution, and he is anxious to show the waiting world that he is competent and ready. More than likely, this first lawsuit will not be very important nor involve extended litigation. Yet, when he appears before the court, he is quite surprised that many of the things he felt he should be permitted to say meet with an objection and strangely enough, the objection is sustained by the court. He, perhaps, is disappointed in the questioning of his own attorney and is not prepared for the rude treatment that he receives on cross-examination. Some of the things that he has said are thrown back at him twisted or as half-truths, and finally, when he steps down from the stand, he is not quite certain of his own name.

"Much to his surprise and indignation, the suit is lost. His first reaction is that his own attorney was, to say the least, incompetent; that the judge was certainly biased; and that the opposing attorney must have arisen from the depths of hell to try that particular suit. This, perhaps, happens not only once but happens several times, and our young surveyor is ready to give up surveying for some other more lucrative field."

Each of us should realize that the surveyor acting as an expert witness occupies a rather unique position before the court. In order for the case to be intelligible either to the jury or the judge, it must be presented in a manner which can be achieved only through the surveyor witness. Because of the nature of his profession and the specific need for facts which only he can supply during the trial, oftentimes his testimony can include much information which in all probability would be excluded in other types of lawsuits.

It behooves all of us, therefore, to take full advantage of these circumstances, bearing in mind that we have a definite and clear cut obligation to the court, our client, and our profession.

[4] "The Surveyor In Court," by Wm. C. Wattles. SURVEYING AND MAPPING, July–September 1953, VOL. XIII, No. 3, page 286.

[5] "West Texas Surveying Problems," by W. A. Rounds. Second Annual Surveyors Association Short Course, October 1953.

To summarize, these rules for survey testimony can be beneficial:

(1) Adequately prepare your case from a standpoint of field and office work, taking into consideration the courtroom where the case is to be tried and its available facilities.

(2) Work closely with your trial lawyer. Do not hesitate to make suggestions. Remember he is trying the case to a great extent along lines that, in some instances, may be strange to him. You are the surveyor and, as such should be the authority on survey problems.

(3) Bear in mind that your lawyer must consider the legal aspects as well as your surveying problems. Therefore, do not argue with him concerning suggestions which you have made and he finds cannot be used.

(4) Be thorough in the preparation of all exhibits, keeping in mind all their basic purposes. Make your exhibits the "showcase" for the trial.

(5) Be deliberate in your testimony. Speak clearly, enunciating each word completely and forcefully. Be certain all interested parties can hear your testimony.

(6) *Never* allow your testimony to become belligerent or show any signs of temper even in heated cross-examination. If you have your facts at hand, your testimony cannot be shaken.

(7) If you do not understand a particular question, do not hesitate to ask that it be repeated. Close attention on your part will tend to hold the repeating of questions to a minimum. Otherwise it might be interpreted as "stalling" on your part which could cause your testimony to lose much of its effectiveness.

(8) If tree blocks, etc. are introduced, be very certain these are properly labeled, taking particular care that each is directly tied by letter or number to your exhibit. This precaution will eliminate any confusion which might arise during the jury deliberations or in the mind of the court.

(9) Always during your testimony or when using a pointer on an exhibit refer to corners by their identifying symbols. Adopt the same procedure when speaking about bearings and distances along various lines. Identify properly and clearly all your testimony in relationship to your exhibits; otherwise it will not appear in the court reporter's records and could lose a winning case especially in the event the case passes above the trial court level.

(10) Finally, do not attempt to hurry through your testimony. You have all the time you need. Attempts to hurry or brush off answers to questions can easily be construed as evasiveness on your part and tend to discredit your work. You are, for the moment, an officer of the court and as such your obligation is to fulfill your duties in the most dignified manner and with the most competent means at your command.

Even an inexperienced surveyor does not have to make many trips to the courthouse as a witness before certain salient features of the judicial procedure begin to form an indelible imprint on his mind and guide his future actions. Personally, it has been my observation that it is a difficult if not impossible matter to over-prepare a boundary lawsuit. Regardless of the time that can be given to it, there is never a point reached when additional study would not be beneficial. Since the trial of a boundary suit is a fact-finding procedure, much effectiveness can be lost when the witness tries to alibi or gloss over positions previously taken, whether it be the case at hand or previous cases in which the witness has participated. Furthermore, on first hand information obtained while acting as a witness in a boundary lawsuit, I know that it can be disastrous for a witness to testify to theories of construction which he has not been in the habit of using on previous work, and which are a matter of record. I have seen it happen in the courtroom as perhaps some of you have. It's never very pleasant. We can benefit greatly if we realize that during the course of any trial there is the possibility of being confronted with past work. Realizing this possibility, we will then be in a position to better equip ourselves to meet all probabilities.

During the past several years I have read and, to some extent, made a study of numerous papers prepared by prominent land boundary lawyers practicing in the State of Texas. Without exception each stated that as attorney on either side they expect all surveyors to give the facts truly and accurately and that it is very seldom indeed they are disappointed. In my opinion this is one of the highest compliments that can be paid to members of our profession by a member of the bar. I am convinced these men did not make this statement lightly. As the most active participants in a lawsuit both the lawyers and the court have every reasonable right to expect candor and frankness on the part of the surveyor witness, especially as these relate to the true facts. Yet there is a third and larger group who, even more than the lawyer and the court, deserve the best effort we can supply—the clients we represent—the men who finally pay the bill. Our individual efforts which collectively form the profession of land surveying cannot rise above that point which it

holds in public confidence and esteem. It cannot and it should not. Therefore, as a profession we should guide our individual actions in a manner that considers the betterment of all. If we consistently follow such a pattern, none of us need fear for the future of land surveyors in Texas, where land boundary placement is at best—difficult.

Announcement

ACSM-ASP Cooperation Study

Occasionally come suggestions that ACSM and ASP should merge. Originally these viewpoints came from persons working in the borderline areas where the activities of the two societies overlap. With each year this border area spreads, as it becomes more common for even small areas to be mapped from the air and as use of photogrammetry extends into cadastral surveys. The spread of interest is further increased by the influx of electronic measuring and computing equipment. The overlap of subject materials for lectures becomes constantly greater so that today one often needs a program to ascertain whether one is in an ASP or an ACSM meeting. The wide field of activities now common to both groups is indicated by the growth in attendance and national recognition of our annual meetings since they became consecutive, and some of the financial advantages of cooperation are indicated by the increased operational efficiency of these meetings under cooperative management by one joint committee.

To my mind, the most telling reason for closer cooperation, even to possible merger, is that fragmentation of the profession in recent decades is a major cause for its weakened position. While not all persons may yet be prepared to accept in full the report of the ASCE Task Committee on the Status of Surveying and Mapping, the fact that this committee, after four years of effort, was unable to draw any clear lines between land surveying, topography, photogrammetry, and engineering does indicate how closely the labors of these fields are fused. It seems to make sense that the voices of these highly integrated branches of the "science of earth measurement" be also better coordinated.

Complete fusion may be possible, with Technical Divisions taking a stronger position in the plan of organization. On the other hand, association loyalties and operational difficulties may make merger impossible but permit greater cooperation on technical and professional activities and increased coordination in operations.

To insure a completely objective study, ACSM and ASP have each determined to appoint corporately independent committees, one for ACSM and one for ASP. Chairman of the ACSM Study Committee is Roland E. (Smokey) Moore. Mr. Moore, although now stationed in Washington, D. C., is a former Chairman of the Northern California Section of ACSM. William A. Radlinski is chairman of the parallel ASP Study Committee. To insure that viewpoints of major governmental offices, as well as of local agencies and private industry, are well represented, the committee to serve under Mr. Moore has been chosen with great care. As a land surveyor myself, may I assure the other members of the ACSM Property Surveys Division, and all personnel belonging to local Sections and Affiliates, that special effort will be made to protect their interests and that no steps will be taken which do not generally further the interests of the organizations. The committee is authorized to do nothing but study and recommend. Further consideration will be given by the Board. If reorganization and merger seem desirable, no action will be taken without a ballot of the membership.

Other members of the committee are:

William C. Cude
Granville K. Emminizer
Victor H. Ghent

Persons, Sections, and affiliated groups having opinions which they wish to have considered are requested to write to the committee in care of Mr. Roland H. Moore, Geological Survey, Washington 25, D. C. For operational reasons, the committee must be based in Washington, but opinions from all areas are desired.

—GEORGE C. BESTOR
President, ACSM

Books in Review

PUBLISHED MAPS OF MONTANA: AN ANNOTATED BIBLIOGRAPHY. Vincent K. Shaudys. Regional Study No. 9, Bureau of Business and Economic Research and Montana State University. Missoula. 1958. 55 pp.

To expedite the use of maps of Montana, the Chairman of the Department of Geography at Montana State University prepared this bibliography for publication in lithographed form by the Bureau of Business and Economic Research and the Montana State University. Although the author made a reasonably comprehensive survey of maps of the State and parts thereof, he included in this listing only those which are easily available to the public, either free or on a fee basis.

The entries are not numbered or indexed, but are grouped according to source:

(1) U. S. Government Maps (Departments of Agriculture, Commerce, Defense, Interior, and State; Federal Power Commission, Post Office Department, and Superintendent of Documents).

(2) Montana State Government Maps (Aeronautics Commission, Agricultural Experiment Station, Board of Railroad Commissioners, Bureau of Mines and Geology, Fish and Game Department, Highway Commission, Office of the State Engineer, and Water Conservation Board).

(3) County Government Maps.

(4) Commercial and Private Maps.

(5) Chamber of Commerce Maps.

The descriptive entries include for most maps (in addition to the title, source, price if known, size, and scale) an account of the area covered and the content in considerable detail.

ARCH C. GERLACH

Library of Congress

REFERENCE GUIDE OUTLINE—Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways—Revised edition, 1958. *U. S. Department of Commerce, Bureau of Public Roads,* Washington, D. C. For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.—price 75 cents.

This publication, prepared by the Photogrammetry for Highways Committee, a joint committee representing the American Society of Photogrammetry and the American Congress on Surveying and Mapping, was originally published in 1956 and was reviewed in SURVEYING AND MAPPING, October–December 1956, Vol. XVI, No. 4, page 499. The new edition, revised to 1958, is now available as noted above.

—HOWARD S. RAPPLEYE

REPORT OF THE SEVENTH ANNUAL TEXAS SURVEYORS ASSOCIATION SHORT COURSE. Texas Surveyors Association 1958. 104 pages.

This publication reports on the Seventh Annual Texas Surveyors Association Short Course, held at the Stephen F. Austin Hotel, Austin, Texas, October 6–8, 1958, under the sponsorship of the Commissioner of the General Land Office (Texas), The Texas Surveyors Association, the University of Texas, the Agricultural and Mechanical College of Texas, the Board of Examiners of Land Surveyors (Texas), and the State Board of Registration for Public Surveyors.

The papers published in this report include:

"The Map Information Office," by J. O. Kilmartin, U. S. Geological Survey, Washington, D. C.

"Surveying in Louisiana," by George Jones, The California Company, New Orleans, La.

"Title and Boundary Problems Relating to Riverbeds," by Kenneth Roberts, Attorney, Humble Oil & Refining Company, Houston, Texas.

"Electronic Computers as Applied to Surveying," by Robert E. Crosser, Titdewater Oil Company, Houston, Texas.

"Boundary Law as Applied to Mexican and Spanish Grants," by Vernon B. Hill, Mission-McAllen, Texas.

"Ethics and the Land Surveyor," by John O. Phillips, Registered Public Surveyor, Houston, Texas.

"A Discussion of the Registered Public Surveyor Examination," by Staley W. Mims,

Chairman, Texas State Board of Registration for Public Surveyors, Crockett, Texas.

"Information Available in the General Land Office," by Ray C. Wisdom, General Land Office, Austin, Texas.

"New Topographic Mapping in Texas," by H. A. Beckwith, Austin, Texas.

Information concerning the availability of this publication may, presumably, be obtained from H. E. Rennels, 1610 Fair Building, Fort Worth, Texas, who is listed as Editor and Chairman of the Publications Committee of the Texas Surveyors Association.

SURVEYING AND MAPPING is gratified to note the following paragraph, under the subhead "Study and Information Sources, Surveying Examination," in the paper by Staley W. Mims:

"The American Congress on Surveying and Mapping is a voluntary association with Central Office at 905 Washington Building, 1435 G Street, N.W., Washington 5, D. C. Membership in this organization may be obtained at a very nominal annual cost and the Quarterly magazine 'Surveying and Mapping' is a most valuable publication to all surveyors."

—HOWARD S. RAPPLEYE

Second United Nations Cartographic Conference

The Second United Nations Cartographic Conference for Asia and the Far East was held in Tokyo, Japan, from October 20, 1958 to November 1, 1958.

Regional cartographic conferences are sponsored by the United Nations in accordance with a resolution adopted by the Economic and Social Council for the purpose of stimulating and promoting the execution of accurate surveys and the publication of maps and charts in accordance with accepted standards to meet the needs of the region.

The conferences provide an excellent forum for the consideration of regional problems and programs; the exchange of information on technical data, materials and organization; and for fostering mutual assistance in the fields of finance, equipment, personnel, and training.

The conference convened under the temporary chairmanship of Dr. Te-Lou Tchang, Chief of the Cartographic Section of the Department of Economic and Social Affairs, United Nations, who also served as Executive Secretary of the Conference. Dr. Chuji Tsuboi, chairman of the delegation of Japan, was elected President of the Conference. General Ihsan Saref Dura of Turkey and Mr. V. Rasaretnam of Ceylon were elected Vice Presidents; and Mr. E. R. Wilson of India, Rapporteur for the Conference.

Twenty-three nations were represented by official delegations and five nations sent observers to the conference. Also represented at the conference were the International Hydrographic Bureau, Pan American Institute of Geography and History, International Geographical Union, International Organization for Standardization, International Union of Geodesy and Geophysics, and the United Nations Secretariat.

The United States was represented by Admiral H. Arnold Karo, Director of the Coast and Geodetic Survey, who served as Chairman of the U. S. delegation, and Dr. Robert H. Randall of the Bureau of the Budget, as Vice Chairman of the delegation. Dr. Randall also represented the Pan American Institute of Geography and History.

Four Technical Committes were established to consider technical reports and papers and to prepare draft resolutions in the following areas: Committee I, Geodesy and Hydrography; Committee II, Topography and Photogrammetry; Committee III, Topical Maps and Photo Interpretation; Committee IV, International Map of the World and Aeronautical Charts. A great number of papers were discussed in each of the technical committees.

At a plenary session of the Conference each nation reported on the progress of its cartographic work since the Mussoorie Conference in 1955.

Of special interest was a resolution adopted by the Conference concerning amendments to the specifications for the International Map of the World (IMW). Considering the need for maintaining both the IMW and the WAC (ICAO World Aeronautical Chart), the Conference recommended the adoption of the Lambert projection as used for the ICAO World Aeronautical Chart series between 80 degrees north and 80 degrees south latitude, and the stereographic projection for the polar regions. It also recommended the adoption of common WAC/IMW sheet lines along the parallels with the option of either WAC or IMW limits on the meridians.

The Conference acted favorably on a resolution for the establishment of a regional intergovernmental cartographic commission or organization for Asia and the Far East and expressed the hope that United Nations Economic Commission at its next session would take concrete steps to implement this resolution.

Abstracts of Articles on Geodesy and Related Fields

The Army Map Service, of the Corps of Engineers, U. S. Army, publishes quarterly a series of processed sheets under the title: "Abstracts of Articles on Geodesy and Related Fields." The following are excerpts from the issue bearing the date of January 1959 and are selected for reprinting in SURVEYING AND MAPPING as being of possible interest to a considerable percentage of our readers. The selection has been somewhat arbitrary, and only those abstracts believed to be of quite general interest have been included.—EDITOR.

437 *We Will Establish a Geophysical Station* (U nas shche se postroi geofizicheska stantsiya). Radoslav Radev

In the vicinity of Gorna Banya village, which belongs to the Greater Sofia area, the first Bulgarian geophysical station will be established very soon.

There will be several large buildings each for one of the following scientific fields: seismology, magnetism, gravimetry, etc. There will be large laboratories, special instrument chambers, an administrative building, various service stations, apartment houses, and even a park.

TEKHNICHESKO DELO (Bulgarian)—AMS-GL-B652.7100, No. 255 (1958)–ma

442 *The Parallactic Measurement with the "Really" Vertical Target* (Le mesurage parallactique a la mire "vraiment" verticale). E. Wolf

Traverses and line observations can be determined with the vertical stadia rod. The author explains a simple computation procedure for the subsections by means of a table and a graph. He examines this method from the point of view of the theory of errors and gives some practical results. The accuracy of this procedure is clearly superior to that of present tachymetric work with the rod and the current limits of accuracy are never exceeded.

REVUE DES GEOMETRES-EXPERTS ET TOPOGRAPHES FRANCAIS (French)—AMS-GL-B623.-7001 (1958) No. 5–ms

444 *Can the Value of the Coefficient of Refraction be Assumed as Approximately Constant?* (Kann der Wert des Refraktionskoeffizienten als annaehernd konstant angenommen werden?). R. Eder

It would be of great value to replace leveling in the high mountains by trigonometric determination of elevations. This, however, cannot be done due to the two components, the deflection of the vertical and refraction. Although the former can be determined, the influence of the latter is not known with certainty.

Determinations of elevations, carried out by the author in the last 20 years, have shown great irregularities which can be ascribed only to the influence of refraction. This led the author to investigate refraction and especially the behavior of the coefficient of refraction. In the last eight years, test measurements were made in the Innsbruck area. The program comprised the following four phases:

a—repeated observations from one point simultaneously to four target points;

b—observations repeated over a fairly long period to a certain target;

c—observations with especially long lines of sight at a high elevation; and

d—reciprocal and simultaneous determinations of elevations.

The author then discusses the four phases in great detail and reaches the following conclusions: The value of the coefficient of refraction varies by about 0.07 units always on condition that there is a sufficient layer of air under the line of sight. For observations close to the ground and in the winter and especially spring, variations may be several times greater than the above value. The absolute value of refraction seems to be substantially greater in the mountains but depends on local conditions. However, no approximate value of general validity can be established for the coefficient of refraction.

ALLGEMEINE VERMESSUNGSNACHRICHTEN (German)—AMS-GL-B664.7002, No. 5, (1958) –ms

446 *The Use of the Tellurometer in Net Densification* (Zur Verwendung des Tellurometers bei Punkteinschaltungen). H. Meier

The author discusses the possibility of using the Tellurometer in net densification, reestablishment of stations and traversing.

He sees the greatest advantage of the Tellurometer in the fact that it is more independent of atmospheric conditions than other methods such as observation of angles, etc.

However, he lists also certain disadvantages such as the need for more towers which are more expensive than simple signals such as crossed vanes etc., the difficulties encountered in reduction to center for eccentric measurements, and the impossibility of determining elevations with the Tellurometer.

However, he sees promise in the use of the Tellurometer for traverse work even though the angles would still have to be measured with the theodolite.

He comes to the conclusion that use of the Tellurometer will probably be of advantage in traversing and in net densification in little populated and wooded areas. Further tests are in progress which may modify present ideas.

ALLGEMEINE VERMESSUNGSNACHRICHTEN (German)—AMS-GL-B664.7002 (1958), No. 7 –ms

447 *Comment on the use of the Tellurometer in Net Densification* (Bemerkung zur Verwendung des Tellurometers bei Punkteinschaltungen).

H. Meier examined the cost of the present methods of net densification as compared to the expected cost of using the Tellurometer especially with regard to the construction of signals (see Abstract No. 446). He came to the conclusion that, especially in forested regions, the cost of constructing signals would be higher than at the present time. In this connection, two articles published in the periodical "The Canadian Surveyor," Vol. XIV No. 2, April 1958, should be of interest.

The first, by Mungall (Canada), also deals with the use of the Tellurometer in forested regions. It confirms Meier's studies. The transmitting and receiving antennae of the Tellurometer have now been separated from the instrument. The parabolic antenna can now be extended to about 12.5 meters above the ground by means of a light aluminum mast which is connected to the instrument tripod. However, the range of the instrument is reduced to about 20 kilometers due to the loss of energy caused by the necessary feeder cables. This new equipment was already submitted to practical tests. The Tellurometer was also changed in such a manner that it will work now also in low temperatures.

The second article by Howlett, the Director of the Department for Applied Physics at the National Research Council, Ottawa, also warns against the danger of enthusiastically overestimating the Tellurometer for distance measurements which would lead only to misapplication. Over distances of more than 50 kilometers, the uncertainty in the velocity of light has so strong an effect that we have to fear that the error limits admissible for first order triangulation will be quickly exceeded. But if the distances are less than 15 kilometers, the instrumental errors which are independent of the distance exercise too great an influence and the possibilities of suitable carrier frequency are too limited.

In conclusion, Howlett emphasizes that, naturally, the tellurometer can be used even today for many purposes over shorter distances, such as the determination of lower order control points where the instrument is not even used to its full capabilities. Nevertheless, he warns emphatically against the bad habit of not using the full capabilities of an instrument for the sake of convenience since this nearly always leads to serious difficulties of all sorts.

These statements which are based on experience give great emphasis to the requests, also made by Meier in an empirical manner, to use the tellurometer according to its purpose and to the warning against uncritical overestimation of newly developed instruments.

ALLGEMEINE VERMESSUNGSNACHRICHTEN (German)—AMS-GLO-B664.7002 (1958) No. 9–ms

466 *Simultaneous Adjustment of Azimuths and Coordinates of Connecting points in Traverse Nets* (Jednoczesne wyrównanie azymutów i wspolrzednych wezlowych w siatkach poligonowych). Jerzy Gazdzicki and Wojciech Janusz

Since the adjustment of extensive traverse nets by the least squares method is very laborious, various methods of approximation are more often used.

The procedures in these methods of approximation are generally divided into the following two phases:

(1) the adjustment of connection elements, i.e. azimuths α, and coordinates x, y:

(2) the adjustment of observations in individual loops between corresponding connection elements.

Each of the connection elements (α, x, y) is

separately adjusted. In such a manner the accuracy may not be satisfied. Therefore, a new method for simultaneous adjustment of α, x, y, is proposed. The following two manners of simultaneous adjustment were suggested: (1) angles and lengths, determined by the connection elements, are adjusted; (2) sums of angles and sums of coordinate increments (departure and latitude), computed for individual loops, are adjusted. In either way one may adjust a net with side connections.

A detailed numerical example, presented in this paper, shows that the results thus obtained are very close to those obtained by the least squares method.

PRACE INSTYTUTU GEODEZJI I KARTOGRAFII (Polish)—AMS-GL-B676.2600, Vol. 6, No. 3 (1957)–ma

469 *Report on the Azimuthal Method of Simultaneous Determination of Geographic Coordinates and Azimuth by Means of Observation of Stars at Equal Altitude* (Badanie azymutalnej metody lacznego wyznaczania wspolrzednych geograficznych i azymutu przedmiotu z obserwacji gwiazd na rownej wysokosci). Ludoslaw Cichowicz

The problem of simultaneous determination of geographic coordinates and azimuth on the basis of a single series of observations is presented in great detail. On the basis of the spherical triangle pole-zenith-star the author derives the necessary formulae. After a thorough analysis of these formulae, a criterion is given for the selection of the best and most suitable observation conditions. Numerous factors were taken into consideration, among them the zenith distance, the arrangement of azimuths, the number of stars.

Special tables and graphs are presented. They illustrate the changes in the mean error under various conditions, the influence of the instrumental errors on the accuracy of determination of geographic coordinates and azimuth as well as the best manner of reducing these errors. A new way of reduction and new formulae for the correction are presented.

As an illustration the result of observations of a series of twelve stars, observed with a Wild T 4 astronomic theodolite, is also presented and analyzed.

The coordinates of the observation position, i.e. the Warsaw Polytechnic Institute, and the azimuth were determined by the Cracovian method as well as by the graphical method.

A description is given of the two catalogues, of stars compiled by the author, for simultaneous determinations on the basis of equal altitude ($h = 60°$ and $h = \phi$). The catalogues are applicable to the determinations at equal altitudes which occur when latitudes are equal to the latitude of the Observatory of the Warsaw Polytechnic Institute.

The suitability of the new method is confirmed. It is especially applicable as a check for astro-geodetic stations of the second and lower orders.

GEODEZJA I KARTOGRAFIA (Polish)—AMS-GL-B676.7300, Vol. 7, No. 1 (1958)–ma

478 *Topographic-Geodetic Secondary Education in the USSR* (Postanovka srednego topografo-geodezicheskogo obrazovaniya v SSSR). S. P. Glinskiy

There are nine secondary special technical schools in the USSR with approximately 7000 students. These schools are located at Moscow, Leningrad, Kiev, Novosibirsk, Chkalov, Tiflis, Tomsk, Saratov, and Semipalatinsk.

For students who had graduated from a secondary school the course at a secondary technical school lasts 2 years and 5 months, for others (who completed 7 grades only) 3 years and 9 months. A total of 2301 hours is required for graduation from any of these secondary technical schools. The following specialized courses are offered: topographic, geodetic, aerophotogrammetric, and aerophotosurvey.

Practical operations in the field as well as laboratory work are also required.

GEODEZIYA I KARTOGRAFIYA (Russian)—AMS-GL-B675.2214, No. 11 (1957)–ma

IT IS NOT TOO EARLY TO BEGIN PLANNING TO ATTEND THE 1960 MEETINGS

Map Information

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.—EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published or became available for distribution by the U. S. Geological Survey between December 1, 1958 and February 28, 1959. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinate and the UTM 1,000-meter grid systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 30 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price; a discount of 40 percent is allowed on orders amounting to $60 or more. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colo., for maps of areas west of the Mississippi).

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* Indicates 15-minute quadrangles; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

Alabama

BELLWOOD—Geneva
CLAYHATCHEE—Dale
COFFEE SPRINGS—Geneva
GENEVA EAST—Geneva
GENEVA WEST—Geneva
HARTFORD—Geneva
MALVERN—Geneva
PETIT BOIS PASS—Mobile
SLOCOMB—Geneva

Alaska

FAIRBANKS D-2*[1]—Fourth Judicial Division
FORT YUKON C-1*—Fourth Judicial Division
HEALY B-6*—Third Judicial Division
JUNEAU D-5*—First Judicial Division
JUNEAU D-6*—First Judicial Division
KATEEL RIVER D-2*—Fourth Judicial Division
KETCHIKAN A-2*—First Judicial Division
KETCHIKAN B-2*—First Judicial Division
KWIGUK D-1*—Second Judicial Division
KWIGUK D-3*—Second Judicial Division
MELOZITNA A-5*—Fourth Judicial Division
MELOZITNA B-2*—Fourth Judicial Division
MELOZITNA B-3*—Fourth Judicial Division
MT. HAYES A-3*—Third Judicial Division
NABESNA C-2*—Fourth Judicial Division
NORTON BAY B-3*—Second Judicial Division
NORTON BAY D-3*—Second Judicial Division
PORT ALEXANDER C-4*—First Judicial Division
PORT ALEXANDER D-2*—First Judicial Division
SAINT MICHAEL A-1*—Second Judicial Division
SAINT MICHAEL A-2*—Second Judicial Division
SAINT MICHAEL A-3*—Second Judicial Division
SAINT MICHAEL A-4*—Second Judicial Division
SAINT MICHAEL A-6*—Second Judicial Division

SAINT MICHAEL B-1*—Second Judicial Division
SAINT MICHAEL B-2*—Second Judicial Division
SAINT MICHAEL C-1*—Second Judicial Division
SAINT MICHAEL C-2*—Second Judicial Division
UNALAKLEET C-1*—Fourth Judicial Division

Arizona

CAMPINI MESA[1]—Cochise
DUQUESNE[1]—Santa Cruz
HEATON KNOLLS*—Mohave
‡HOUSE ROCK SPRING NW—Coconino
‡HOUSE ROCK SPRING SW—Coconino
HUNT*—Apache
JOSEPH CITY*—Navajo
NACO—Cochise
NAZLINI*—Apache
PAUL SPUR—Cochise
‡SHINARUMP NE—Coconino
‡SHINARUMP SE—Coconino
‡SHINARUMP SW—Coconino
TUCSON*[2]—Pima
TUCSON NORTH—Pima
WINCHESTER MTS.*[1]—Cochise
YELLOWSTONE CANYON*—Apache

Arkansas

DEE*—Craighead
DECKERVILLE*—Poinsett
ELKINS—Washington
FAYETTEVILLE—Washington
GOSHEN—Washington
HINDSVILLE—Madison
HUNTER*—Woodruff
JONESBORO*—Craighead
MUNDELL—Carroll
SPRING VALLEY—Washington
WAR EAGLE—Benton
WYNNE*—Cross

Arkansas-Missouri

BEAVER—Carroll
GARFIELD—Benton

California

BRAWLEY NW—Imperial
CAMP NELSON*—Tulare
COALINGA*[1]—Fresno
CORNING*[2]—Tehama
COURTLAND*[2]—Yolo
DOWNIEVILLE*[2]—Sierra
DUNCAN PEAK*[2]—Placer
ENTERPRISE—Shasta
FALLEN LEAF LAKE*[2]—El Dorado
GONZALES*[1]—Monterey
GREENFIELD*[1]—Monterey
HOCKETT PEAK*—Tulare
KREYENHAGEN HILLS*—Fresno
LEAD MOUNTAIN*[2]—San Bernardino
PROJECT CITY—Shasta
REDDING—Shasta
SONOMA*[2]—Sonoma

California-Nevada

FREEL PEAK*—El dorado

Colorado

ALDRICH GULCH—Custer
BERTHOUD PASS—Grand
BOWEN MOUNTAIN—Grand
BYERS PEAK—Grand
COMO—Park
CORE PASS*—Grand
KREMMLING*—Grand
LYONS*—Boulder
PONCHA SPRINGS*—Chaffee
RAYMOND—Boulder

Connecticut

TORRINGTON[1]—Litchfield

Florida

CAPTIVA—Lee
GOODNO—Glades
LA BELLE—Hendry
LA BELLE NW—Glades
MATLACHA—Lee
PALMDALE—Glades
PINE ISLAND CENTER—Lee
PORT BOCA GRANDE—Lee
TELEGRAPH SWAMP SE—Charlotte

Georgia

CLARKESVILLE NE—Habersham
RICEBORO—Liberty
SEABROOK—Liberty

Georgia-South Carolina

RAINY MOUNTAIN—Rabun

Hawaii

HAIKU—Maui
KAUPO—Maui
KEANAE—Maui
KIPAHULU—Maui

Idaho

BLAINE*—Camas
CARTWRIGHT CANYON—Boise
DAVIS MOUNTAIN*—Camas
DIAMOND PEAK*—Butte
EMIDA*—Benewah
FAIRFIELD*—Camas
GILMORE*—Lemhi
GIVENS HOT SPRINGS—Owyhee
HAWLEY MOUNTAIN*—Butte
KELLOGG*—Shoshone
OPALENE GULCH—Owyhee
OWYHEE—Ada
PLUMMER*—Benewah
ST. MARIES*—Benewah
STURGILL PEAK*—Washington
TENSED*—Benewah
THORN CREEK SW—Gooding
WALTERS BUTTE—Canyon
WARM SPRINGS POINT—Boise
WILSON PEAK—Owyhee

Idaho-Montana

MORRISON LAKE*—Beaverhead

Idaho-Oregon

COPPERFIELD*—Baker
CUPRUM*—Adams

Idaho-Wyoming

WARM RIVER BUTTE*—Fremont

Indiana

AUBURN—De Kalb
BIRDSEYE—Dubois
CLAY CITY—Clay
DEMOTTE—Jasper
FORT WAYNE WEST—Allen
FREEDOM—Owen
INWOOD—Marshall
JONESVILLE—Bartholomew
KNOX EAST—Starke
KNOX WEST—Starke
OOLITIC—Lawrence
WHEATFIELD—Jasper

Kansas

BOICOURT—Linn
FONTANA—Miami
HAMMOND—Bourbon
NEW LANCASTER—Miami

Kentucky

EARLINGTON*[2]—Hopkins

Louisiana

BASKINTON*—Franklin
BAYOU L'IVROGNE*—Natchitoches
BIRDS CREEK—Vernon
BONITA*—Morehouse
BONNET CARRÉ*—St. Charles
BURR FERRY—Vernon
BURTON CREEK—Vernon
CHOPIN*[2]—Natchitoches
DOOR POINT—St. Bernard
FALSE MOUTH BAYOU—St. Bernard
FLORIEN*[2]—Sabine
FORT POLK—Vernon
FULLERTON LAKE—Vernon
GORUM—Natchitoches
HORNBECK—Vernon
HURRICANE*—West Carroll
HUTTON—Vernon
JERICHO—Vernon
KISATCHIE—Natchitoches
KISATCHIE*[2]—Natchitoches
KURTHWOOD—Vernon
LACAMP—Vernon
LAKE ATHANASIO—St. Bernard
LAKE EUGENIE—St. Bernard
LEANDER*[2]—Vernon
LEANDER SE—Vernon
LEESVILLE—Vernon
LEESVILLE*[2]—Vernon
MALHEUREUX POINT—St. Bernard
MITCHELL KEY—St. Bernard
MONROE NORTH*—Ouachita
MORGAN HARBOR—St. Bernard
OAK GROVE*—West Carroll
OAK MOUND BAYOU—St. Bernard
PEASON—Sabine
POINT CHICOT—St. Bernard
PTE. AUX MARCHETTES—St. Bernard
ST. MARTINVILLE*—St. Martin
SHACKLEFORD LAKE*—Tenses
SIEPER—Rapides
SLAGLE—Vernon
SLAGLE*[2]—Vernon
SOUTHWEST PASS*—Plaquemines
TEMPLE—Vernon
THREE MILE BAY—St. Bernard
WINNSBORO*—Franklin
YSCLOSKEY—St. Bernard

Maine

CAPE ELIZABETH[1]—Cumberland
CUMBERLAND CENTER—Cumberland
ELLSWORTH*[1]—Hancock
GORHAM[1]—Cumberland
NEW HARBOR—Lincoln

Maryland

ANNAPOLIS[1]—Anne Arundel
BELTSVILLE—Prince Georges
COCKEYSVILLE[1]—Baltimore
DEALE[1]—Anne Arundel
LANHAM[1]—Prince Georges
PISCATAWAY[1]—Prince Georges
SOUTH RIVER[1]—Anne Arundel
TOWSON[1]—Baltimore

Maryland-District of Columbia

ANACOSTIA—District of Columbia
WASHINGTON EAST—District of Columbia

Maryland-Pennsylvania

NORRISVILLE[1]—Harford

Maryland-West Virginia-Pennsylvania

WILLIAMSPORT*[2]—Washington

Massachusetts

MARBLEHEAD NORTH[1]—Essex
MARBLEHEAD SOUTH[1]—Essex
SALEM[1]—Essex
WACHUSETT MTN.[1]—Worcester
WAREHAM[1]—Plymouth

Michigan

BEAVER ISLAND*—Charlevoix
CADILLAC NORTH*—Wexford
CADILLAC SOUTH*—Wexford
CHEBOYGAN*—Cheboygan
GULL ISLAND*—Charlevoix
HARRISON*—Clare
HOG ISLAND*—Charlevoix
LUTHER*—Lake
MARION*—Osceola

MULLETT LAKE*—Cheboygan
NORTH MANITOU*—Leelanau
NORTHPORT*—Leelanau
SOUTH FOX ISLAND*—Leelanau
TOWER*—Cheboygan
TRAVERSE CITY*—Grand Traverse
WELLSTON*—Manistee
WOLVERINE*—Cheboygan

Minnesota

BELLE PLAINE*—Scott
BRIMSON*—St. Louis
CASTLE DANGER—Lake
FARMINGTON*—Dakota
FOREST CENTER*—Lake
GABBRO LAKE*—Lake
NEW PRAGUE*—Scott
OLIVIA*—Renville
PELAN*—Kittson
PRIOR LAKE*—Scott
TWO HARBORS*—Lake
TWO HARBORS NE*—Lake
WACONIA*—Carver

Minnesota-Wisconsin

HASTINGS*—Dakota

Mississippi

BAY ST. LOUIS—Hancock
LEXINGTON*—Holmes
SEVEN PINES*—Carroll

Mississippi-Arkansas

PACE*—Bolivar

Mississippi-Louisiana

ARTONISH*—Wilkinson

Missouri

BEULAH—Phelps
BIG PINEY—Pulaski
BLOODLAND—Pulaski
BROWNFIELD—Laclede
CROCKER—Pulaski
DEVILS ELBOW—Pulaski
DIXON—Pulaski
DREW—Laclede
DRYNOB—Laclede
EDGAR SPRINGS—Phelps
FLAT—Phelps
HANCOCK—Pulaski
MAPLES—Texas
OZARK SPRINGS—Pulaski
RICHLAND—Pulaski
ROBY—Texas
SLABTOWN SPRING—Texas
WAYNESVILLE—Pulaski
WINNIPEG—Laclede

Montana

ST. REGIS*—Mineral
STEPHENS HILL—Sweet Grass

Montana-Idaho

COOPER GULCH*—Sanders

Montana-Wyoming

COOKE CITY*—Park

Nebraska

BEATRICE EAST—Gage
PLYMOUTH—Jefferson
WILBER—Saline

Nevada

BATTLE MOUNTAIN*—White Pine
BUCK MOUNTAIN*—White Pine
CARSON CITY*—Ormsby
COMO*—Lyon
DIAMOND SPRINGS*—Eureka
DUNPHY*—Eureka
VISTA—Washoe
WABUSKA*—Lyon
WELLINGTON*—Lyon
YERINGTON*—Lyon

Nevada-California

MT. SIEGEL*—Douglas

New Hampshire

HAMPTON[1]—Rockingham
PENACOOK*[1]—Merrimack

New Jersey

HEISLERVILLE—Cumberland

New Mexico

GRANTS SE—Valencia
McCARTYS—Valencia
SAN RAFAEL—Valencia
TIERRA AMARILLA*—Rio Arriba

New York

AFTON—Chenango
BELDEN—Broome
CLEVELAND[1]—Oswego
CLINTONDALE[1]—Ulster
CORNWALL—Orange
GOSHEN[1]—Orange
HOPEWELL JUNCTION—Dutchess
JAMAICA—Queens
JEWELL[1]—Oneida
MANLIUS[1]—Onondaga
MOHEGAN LAKE—Westchester
OSCAWANA LAKE—Putnam
PLEASANT VALLEY—Dutchess
POPOLOPEN LAKE—Orange
POUGHKEEPSIE—Dutchess
SARDINIA—Erie

North Carolina

ASHEBORO*—Randolph
BLADENBORO*—Bladen
DENTON*—Davidson
DREXEL—Burke
ELIZABETHTOWN*—Bladen
GOLDSBORO*—Wayne
LENOIR—Caldwell
MORGANTON NORTH—Burke

North Dakota

BERGEN—McHenry
BRINSMADE—Benson
CANDO SE—Ramsey
CHURCHS FERRY—Ramsey
KARLSRUHE—McHenry
RANGELEY—McHenry
RANGELEY SE—McHenry
WEBSTER—Ramsey

Ohio-West Virginia-Kentucky

CATLETTSBURG[1]—Boyd

Oklahoma

ADA—Pontotoc
CENTRAHOMA—Coal
COOPERTON—Kiowa
GLEN MOUNTAINS—Kiowa
LULA—Pontotoc
MANITOU—Tillman
ODETTA—Kiowa
PEARSON—Pottawatomie
RAINY MOUNTAIN CREEK—Kiowa
SASAKWA—Seminole
SNYDER—Kiowa
STEEDMAN—Pontotoc
STONEWALL—Pontotoc
UNAP MOUNTAINS—Kiowa

Oklahoma-Texas

WADE*—Bryan

Oregon

CALIMUS BUTTE*—Klamath
DAYTON—Yamhill
DURKEE*—Baker
ELMIRA*[1]—Lane
ENTERPRISE*—Wallowa
JOSEPH*—Wallowa
KLAMATH MARSH*—Klamath
McMINNVILLE—Yamhill
SHERIDAN*—Yamhill
SILTCOOS LAKE*—Lane
SPARTA*—Baker
TIDEWATER*[1]—Lincoln
WALDPORT*—Lincoln

Oregon-Idaho

HALFWAY*—Baker
HE DEVIL*—Idaho
MINERAL*—Baker

Oregon-Washington

THE DALLES*—Wasco

Pennsylvania

EAST TROY—Bradford
ERIE NORTH—Erie
FAIRVIEW—Erie
MIDDLETOWN*[1]—Dauphin
MILFORD SQUARE[1]—Bucks
SWANVILLE—Erie

Pennsylvania-New York

POTTER BROOK—Tioga
SAYRE—Bradford

Puerto Rico

BAYAMON[1]—Bayamon
CENTRAL LA PLATA[1]—San Sebastian
GUANICA[1]—Guanica

Rhode Island

BLOCK ISLAND[1]—Newport
EAST GREENWICH—Kent
WICKFORD[1]—Washington

South Carolina

EASLEY*—Pickens
STALLSVILLE—Dorchester
SUMTER EAST—Sumter

South Carolina-Georgia

TUGALOO LAKE—Oconee

South Dakota

ALEXANDRIA—Hanson
CAVOUR—Beadle
CLAYTON—Sanborn
FARWELL—Sanborn
FORESTBURG—Sanborn
FORESTBURG NE—Sanborn
GAYVILLE—Yankton
HURON—Beadle
JAMESVILLE—Yankton
LETCHER NE—Sanborn
LOOMIS—Davison
MAYFIELD—Yankton
MENNO—Hutchinson
MIDWAY—Yankton
MILLTOWN—Hutchinson
MISSION HILL—Yankton
MITCHELL—Davison
RIVERSIDE—Hanson
SCOTLAND—Bon Homme
TSCHETTER COLONY—Hutchinson
WOLF CREEK—Hutchinson

Tennessee

DUCKTOWN—Polk
MECCA—McMinn
HENDERSONVILLE[1]—Sumner
NASHVILLE EAST—Davidson

Tennessee-North Carolina

BALD RIVER FALLS—Monroe
FARNER—Polk
ISABELLA—Polk

Texas

ALLEYTON—Colorado
ARMSTRONG*[2]—Kenedy
COLUMBUS—Colorado
DALLAS—Dallas
EDCOUCH—Hidalgo
HARLINGEN—Cameron
HUTCHINS—Dallas
OAK CLIFF—Dallas
PASO REAL—Willacy
SANTA MARIA—Cameron
SHERMAN NW—Grayson
WEST BROWNSVILLE[1]—Cameron
WHITE ROCK LAKE—Dallas

Utah

CEDAR CITY*[2]—Iron
HURRICANE*—Washington

IRON MOUNTAIN*[2]—Iron
ORANGE CLIFFS*—Garfield
‡VERDURE 1 NW—San Juan
‡VERDURE 3 NW—San Juan
‡VERDURE 3 SW—San Juan
WEST MOUNTAIN*[2]—Utah

Utah-Colorado

‡VERDURE 1 NE—San Juan
‡VERDURE 1 SE—San Juan

Vermont

LONDONDERRY*—Windham

Virginia

BIG STONE GAP—Wise
MANASSAS[1]—Prince William

Virginia-North Carolina

CLARKSVILLE[1]—Mecklenburg
HOLLAND*[1]—Nansamond
SOUTH BOSTON—Halifax

Virgin Islands

EASTERN ST. JOHN—St. John

Washington

ABERDEEN SE—Grays Harbor
AENEAS VALLEY*—Okanogan
BADGER POCKET*[2]—Kittitas
BLACK ROCK SPRING*[2]—Yakima
BREWSTER*—Okanogan
BRIDGEPORT*—Douglas
CAIRN HOPE PEAK—Yakima
CLALLAM BAY*—Clallam
CONCONULLY*—Okanogan
COPALIS BEACH—Grays Harbor
EMERSON NIPPLE—Benton
ENUMCLAW*—King
GOLDENDALE*—Klickitat
LAKE PLEASANT*—Clallam
MONROE—Snohomish
MORTON*—Lewis
OKANOGAN*—Okanogan
POINT BROWN—Grays Harbor
PRIEST RAPIDS—Grant
RICHARDSON*[1]—San Juan
SPIRIT LAKE*—Skamania
TONASKET*—Okanogan
WILLARD*—Skamania
WIND RIVER*—Skamania
YAKIMA EAST*[2]—Yakima

West Virginia

BLUE CREEK—Kanawha
LOONEYVILLE—Roane
WINSLOW—Wayne

West Virginia-Ohio

WILLOW ISLAND—Pleasant

Wyoming

BEARTOOTH BUTTE*—Park
BRIDGER PASS*—Carbon
BRINGOLF RANCH[1]—Fremont
DOTY MOUNTAIN*—Carbon
GRASSY LAKE RESERVOIR*—Teton
HUCKLEBERRY MOUNTAIN*—Teton
OLD FAITHFUL*—Yellowstone National Park
PILOT PEAK*—Park
SUNLIGHT PEAK*—Park
WEST THUMB*—Yellowstone National Park

Wyoming-Colorado

BAGGS*—Carbon

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alaska

BEAVER†
BETTLES†
CHANDALAR†
CHRISTIAN†
COLEEN†
GARELOI ISLANDS†
HOWARD PASS†
KILLICK RIVER†
KISKA†

Florida

DAYTONA BEACH
GAINESVILLE
KEY WEST

Indiana-Illinois-Kentucky

VINCENNES

Michigan-Ontario

FLINT

Minnesota-Wisconsin

STILLWATER

Nevada

WINNEMUCCA

Oregon

BEND

Washington

RITZVILLE

Washington-British Columbia

CONCRETE

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States. A catalog showing the areas described below is available free upon request.

21.—Coast Chart, Lake Ontario. Clayton, N. Y., and Kingston, Ont., to Stony Point, N. Y., and False Duck Islands, Ont., at 1:80,000 scale. (December 1958)

34.—Coast Chart, Lake Erie. Eight miles east of Ashtabula, Ohio, to 15 miles west of Fairport, Ohio, at 1:80,000 scale. Inset: Menton Harbor, Ohio, at 1:10,000 scale. (January 1959)

511.—South End of Lake Huron. One mile north of Lakeport, Mich., to and including in detail, Head of St. Clair River, at 1:15,000 scale. (December 1958)

821.—Rainy Lake Chart. Dryweed Island, Minn., to Big Island, Minn., at 1:25,000 scale. (January 1959)

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between December 1, 1958, and February 28, 1959. The class or purpose of the survey is indicated. Copies of plats may be secured from the Bureau offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alaska

U. S. Survey No. 3518—Horseshoe Lake Small Tract Group
U. S. Survey No. 3519—Horseshoe Lake Small Tract Group
U. S. Survey No. 3520—Horseshoe Lake Small Tract Group
U. S. Survey No. 3532—Lawing Homesite Group

Alaska—Seward Meridian

T. 16 N., R. 1 E.—Extension survey
T. 17 N., R. 4 W.—Extension survey

Alaska—Fairbanks Meridian

T. 10 S., R. 11 E.—Survey, part of subdivision

Arizona—Gila and Salt River Meridian

T. 14 N., R. 11 W.—Survey of subdivision—all

California—Mount Diablo Meridian

T. 31 N., R. 6 W.—Resurvey and subdivision of sections

California—San Bernardino Meridian

T. 1 S., R. 7 E.—Survey of section 6
T. 15 S., R. 8 E.—Resurvey and subdivision of section

Colorado—Sixth Principal Meridian

T. 3 S., R. 78 W.—Resurvey and subdivision of sections
T. 11 N., R. 82 W.—Dependent resurvey—part

Colorado—New Mexico Principal Meridian

T. 34 N., R. 20 W.—Extension survey

Florida—Tallahassee Meridian

T. 19 S., R. 20 E.—Survey of island

Idaho—Boise Meridian

T. 8 S., R. 14 E.—Survey of islands
T. 9 S., R. 14 E.—Survey of islands
T. 9 S., R. 15 E.—Survey of islands
T. 14 S., R. 32 E.—Dependent resurvey

Michigan—Michigan Meridian

T. 10 N., R. 9 W.—Survey of islands
T. 1 N., R. 10 W.—Survey of islands

Minnesota—Fourth Principal Meridian

T. 31 N., R. 21 W.—Survey of islands
T. 39 N., R. 24 W.—Survey of islands
T. 56 N., R. 26 W.—Survey of islands

Minnesota—Fifth Principal Meridian

T. 142 N., R. 34 W.—Survey of islands

Montana—Principal Meridian

T. 18 N., R. 17 E.—Resurvey and subdivision of sections
T. 18 N., R. 18 E.—Resurvey and subdivision of sections

Nevada—Mount Diablo Meridian

T. 26 N., R. 48 E.—Survey—part of township
T. 5 N., R. 66 E.—Independent resurvey
T. 6 N., R. 66 E.—Independent resurvey
T. 4 N., R. 67 E.—Independent resurvey
T. 22 S., R. 63 E.—Dependent resurvey—part

New Mexico—New Mexico Principal Meridian

T. 15 N., R. 1 W.—Survey, part of subdivision
T. 16 N., R. 1 W.—Survey, part of subdivision
T. 17 N., R. 1 W.—Survey, part of subdivision
T. 4 N., R. 5 W.—Dependent resurvey—all
T. 30 N., R. 8 W.—Dependent resurvey—all

Oklahoma—Indian Meridian

T. 4 N., R. 20 W.—Survey of accretion (Photogrammetric)

Oregon—Willamette Meridian

T. 36 S., R. 3 E.—Resurvey and subdivision of sections
T. 36 S., R. 2 W.—Resurvey and subdivision of sections

Utah—Salt Lake Meridian

T. 2 S., R. 1 E.—Resurvey and subdivision of sections

Utah—Ute Meridian

T. 2 N., R. 1 E.—Dependent resurvey—part

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Comment and Discussion

STATUS OF SURVEYING AND MAPPING

WALTER S. DIX*—The Board of Direction of the ACSM wishes to take this opportunity to express its appreciation to the American Society of Civil Engineers and its Surveying and Mapping Division for the recent activities of its Task Committee on Status of Surveying and Mapping.

The successive reports of the Task Committee, we feel, have healthfully stimulated vital discussion and interest in this perplexing national problem.

We feel further that the Final Report of the Task Committee of October 1958 is a good basis for further studies.

The ACSM Board appreciates having had the opportunity to lend its support to the Task Committee's discussions by printing the various phases of the study in its journal, SURVEYING AND MAPPING, and by distributing them to many other surveying and mapping groups throughout the country.

We particularly appreciate having been able to have one of our representatives sit with your Task Committee in its deliberations.

We note the action of your Board of Direction last month including within the realm of engineering the four categories, Land Surveying, Engineering Surveying, Geodetic Surveying, and Cartographic Surveying, and your directive to your standing committees to further endeavor in regard to your Board action.

Our Board knows that within the membership of the Congress there is a general accord with the report and the ASCE action, while recognizing that there are some elements of the matter that will need further clarification through study and discussion.

Recognizing that it will be necessary to act with the greatest care in such an important matter involving the welfare and interests of so many members of both our Societies, we wish to state that ACSM stands ready to collaborate actively with any committee of ASCE to continue to pursue this matter actively in an effort to arrive at a final solution that we feel will be in the best interests of the entire profession.

* Letter from the Executive Secretary, ACSM, under date of March 28, 1959, to the American Society of Civil Engineers, attention of William H. Wisely, Executive Secretary, ACSE.

William H. Wisely*—This will acknowledge and thank you for your letter of March 28 offering the collaboration of the American Congress on Surveying and Mapping in the execution of the recommendations contained in the report of our Task Committee on Status of Surveying and Mapping.

To begin with, may I say that we appreciate the ACSM participation in the Task Committee, and also the general endorsement of the Congress of the findings set forth in the report.

Your letter is being brought to the attention of the three committees of the Society which have been requested to interpret and to develop detailed recommendations on our implementation of the report. I am sure that these committees will take advantage of your offer to assist in the event that there is a need.

In the meantime, we are gratified to have your interest and support in this important move.

* Letter from the Executive Secretary of The American Society of Civil Engineers, dated April 2, 1959, to The Executive Secretary of the ACSM.

AT LAST—POPULAR RECOGNITION OF SURVEYING AND MAPPING

It has been said that "a picture is worth a thousand words" and that when you find yourself in the graphic color cartoon section of the Sunday newspapers, you have been discovered. Surveying and mapping, then, has been discovered. In the *Washington Sunday Post and Times Herald* of April 12, 1959, a graphic color release by The Hall Syndicate appeared in the "Comic Section" as "OUR NEW AGE." This is a graphic cartoon, popularizing modern science, by Athelstan Spilhaus, Dean, University of Minnesota Institute of Technology, and Earl Cros, depicting the transition from GEOMETRY —Greek for *Measure Earth*—to the ultra modern preciseness now so necessary for missile guidance or space navigation.

Beginning with an ancient Greek calculating triangles from angles and distances, and a modern land surveyor sighting on a rod held by a medieval rodman, from whence came the maps of our planet; the next picture shows an aeroplane high above the fields and towns below, depicting fast and relatively accurate mapping by photography. Then comes radar and even the Tellurometer measuring by radio beams. The use of the moon is shown to provide the third point of a triangle to span the oceans between continents. All sorts of cartoon folk are shown taping and scaling a globular miniature world only to realize that its exact shape and size are not yet known. Showing modern rockets circling the space above the earth in all directions, summation is made that recognizes the importance of exact measurements and precision so necessary for modern surveying and mapping for pinpointing today's and tomorrow's location and track from place to place.

—WALTER S. DIX

LOCATING A MISTAKE IN TRAVERSE ANGLES

Engineering News-Record, April 16, 1959, Vol. 162, No. 15, page 78, calls attention to a method, reported by E. D. Jones, New England Survey Service, Inc., West Hartford, Conn., for locating the station at which a mistake in reading a traverse angle has been made, *provided that* only one angle has been misread and the lengths are good. The scheme is as follows:

Assume an azimuth or bearing for one line and the coordinates for one end of that line. Compute the coordinates of all stations of the traverse in the clockwise order, and then compute them again in the counterclockwise order. The station at which the coordinates agree is the one at which the angle was misread. If the traverse closes the first time around, the mistake is in the closing angle.

—EDITOR

45TH ANNUAL ILLINOIS HIGHWAY ENGINEERING CONFERENCE

GORDON GRACIE*—Part of the program of the 45th Annual Illinois Highway Engineering Conference held at the University of Illinois was a group meeting on Aerial Photography and Photogrammetry Applications to Highway Work.

Professor H. M. Karara of the Department of Civl Engineering, University of Illinois, presided, and the following gentlemen were the discussion leaders: Professor A. Brandenberger, Ohio State University, Columbus, Ohio; H. L. Brantley, Illinois Division of Highways, Springfield, Illinois; E. M. Raley, Photronix, Inc., Columbus, Ohio; and Professor N. Chryssafopoulos, University of Illinois.

Four topics were discussed: Photogrammetry and its basic principles; the advantages of photogrammetry over classical methods of field mapping; the role of aerial photographs in highway design and the mechanization of highway design; and geologic and soil studies of aerial photographs for highway work.

A brief summary of the meeting will be contained in a general report on the entire conference which will be published at a later date.

* Instructor in Civil Engineering, 205 Surveying Building, University of Illinois, Urbana, Illinois.

METRIC SYSTEM IN THE UNITED STATES

FLOYD W. HOUGH*—Pursuant to the resolution adopted unanimously at the business session of the American Geophysical Union on May 7, 1958, (Reference: *Transactions,* June 1958, p. 558) President Ewing appointed a "Committee on Adoption of the Metric System in the United States."

Bills for the compulsory adoption of the metric system in the United States have been more than once presented to Congress, but they failed, the principal reason being that the effective date proposed was entirely too soon after the passage of the bill. An early effective date

* Chairman, "Committee on Adoption of the Metric System in the United States."

would undoubtedly work a severe hardship on the adult population not familiar with the metric system, and is would make obsolete a prohibitive amount of every day items of weights and measures. A solution would appear to be a bill to make the metric system the only official system of weights and measures in the United States, effective in not less than one generation, 33 years, after passage of the bill. Following this action by the Congress, the grade schools and high schools could begin immediately to teach children the metric system along with the English system and, during the transition period, could place more and more emphasis on the metric system. By the end of the transition period, the English system could be taught, but the emphasis would be completely reversed from what it is today. A long transition would result in a smooth change. In a generation, most items of equipment involving weights and measures normally become obsolete or worn out and replaced. Also, persons engaged in professions and trades now using the English system exclusively would normally pass on to retirement during this period and would be replaced by a new generation thoroughly educated and trained in the metric system.

QUESTIONNAIRE

The following questionnaire is directed to readers for the purpose of gathering statistical information to indicate the degree of interest in this matter. The metric committee of the American Geophysical Union will welcome any comments. Those submitting replies are urged to suggest solutions to difficulties which may be foreseen in the adoption of the metric system.

Additional copies of the questionnaire are available upon request. A small effort on your part to complete and mail this questionnaire will be of invaluable help to the committee—it should be mailed to: Executive Secretary, American Geophysical Union, 1515 Massachusetts Avenue, N.W., Washington 5, D. C.

ACSM Professional Status Committee

The ACSM Professional Status Committee for the 1959–60 period has been appointed by President Bestor with the following members: Lester C. Higbee, *Chairman;* Victor H. Ghent, Box 937, Route 1, Annandale, Va.; Howard J. Teas, 125 Church St., Malverne, N. Y.; Prof. Ralph Moore Berry, Department of Civil Engineering, University of Michigan, Ann Arbor, Mich.; William A. White, 1107 9th St., Suite 811, Sacramento 14, Calif.; John I. Davidson, 9017 Lindale Drive, Bethesda, Md.; Granville K. Emminizer, Coast and Geodetic Survey, Room 3800, Commerce Building, Washington 25, D. C.; Capt. A. J. Hoskinson, 4402 Fessenden St., N.W., Washington 16, D. C.; Winfield H. Eldridge, University of Illinois, Urbana, Ill.; Francis L. Witkege, U. S. Geological Survey, Washington 25, D. C.; and James L. Bell, Box 8885, Prairie Village, Kans.

This committee's first assignment will be to examine from the ACSM's point of view the report of the ASCE Task Committee on Status of Surveying and Mapping to determine whether said report shall be adopted as policy of the ACSM, adopted with modifications, or whether a separate policy statement should be made by the ACSM. Upon arriving at a recommended policy position for the American Congress on Surveying and Mapping, the committee's subsequent task will be to determine what steps should be taken in the light of that policy to improve the present confused situation relative to education and professional status in the surveying and mapping field.

This is a vital matter now before the profession, and all interested persons are requested to submit their opinions to the chairman. Duplication of opinions furnished the ASCE committee are not necessary as the files thereof are open to the ASCM committee and will be consulted.

Chairman Higbee may be reached in care of the W. & L. E. Gurley Co., 530 Fulton St., Troy, N. Y.

Old Transit Given to Fenn College

A transit instrument, made between 1840 and 1851 by William I. Young & Son, Philadelphia, will be placed on display permanently in the new Engineering & Science Building at Fenn College this fall. The transit, used by the Erie Railroad Company in laying out its Western Division (Hornell to Dunkirk, N.Y.), was presented to Fenn College on May 5, 1959, by W. R. Swatosh, Assistant Superintendent of Construction, Erie Railroad Company.

METRIC SYSTEM QUESTIONNAIRE

(Place check marks in the appropriate places)

1. Indicate professional field of interest._____
2. What approximate percentage of units used in your work are: Metric_____ British_____ Other_____
3. Would it be to your advantage if a complete conversion to the metric system could eventually be made? Yes_____ No_____
4. How long a period of time should be allowed for the conversion, in years? 10_____ 20_____ 30_____ 40_____ 50_____ Longer_____
5. Should the centigrade system of temperature measurement be adopted? Yes_____ No_____
6. Do you believe that U. S. export trade is suffering due to the use of British units? Yes_____ No_____ No opinion_____
7. Do you believe that the eventual adoption of the metric system is inevitable? Yes_____ No_____
8. In the event of a long time conversion to the metric system, do you believe that the cost would be prohibitive? Yes_____ No_____
9. In the event a Joint Committee were established to study the problem, circulate questionnaires, accumulate statistics, and report: It should be sponsored by: (Check one)
   Professional Societies_____
   Educational Institutions_____
   Industry_____
   Government_____
   How should such a study be financed?_____
   Would you be willing to assist such a study group?
   Financially_____
   As an advisor_____
10. Additional remarks at any length are welcomed _____

_____

_____

_____

_____

_____

Signature (Optional)

❦ ❦ ❦

Report on Scribing

Two more sections of the *Report on Scribing*[1] have been published.

Part III, "Glossary of Terms," was published by the Inter-Agency Committee on Negative Scribing,[2] Washington, D. C., in September 1958. This comprises five loose-leaf sheets, punched to fit a standard three-ring binder, and includes a title page, a foreword, and five pages of definitions of terms as applied particularly to scribing.

The Tennessee Valley Authority section of Part II is a four-page loose-leaf publication pertaining particularly to scribing techniques of the T.V.A.

[1] *See* SURVEYING AND MAPPING, Vol. XVIII, No. 2, April–June 1958, page 264.

[2] Committee of U. S. Federal Mapping Agencies reporting to the Bureau of the Budget.

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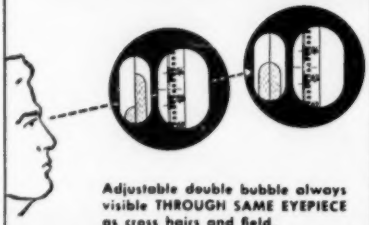

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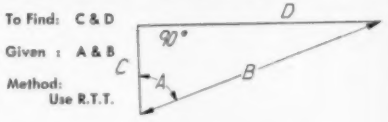

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News of Related Organizations

Virginia Association of Surveyors

The Eleventh Annual Meeting of the Virginia Association on Surveyors, Inc., was held February 6–7, 1959, at the Chamberlain Hotel, Old Point Comfort, Va. The balmy, crisp weather matched the mood of the approximately 90 surveyors plus wives and guests who gathered to relax and enjoy "survey" talk. The Friday afternoon session consisted of setting up the agenda for the Saturday business session, to assure that anyone who had a problem for discussion would have the opportunity to present it. Friday evening a "smoker" and dance were staged by the "Plumb Bob Club."

Highlights of the Saturday business session included:

(1) A report on the successful legislative effort last spring.[1] Assistance in raising money to pay attorney fees for the court case preceding the legislative effort was afforded by raffling a David-White transit at the meeting.

(2) Financial statements showed that the expanding membership of the Association would require increasing membership dues to $10 per year. A "sampling ballot" indicated that the members would approve a dues raise, and its was so moved and approved at the meeting.

(3) The Association voted to have 1,000 copies of the Code of Ethics for Surveyors printed and mailed to all licensed surveyors in Virginia, along with an invitation to join the VAS.

(4) It was voted to have a VAS roster and other pertinent information about VAS printed in booklet form for distribution to the membership.

(5) Request will be made to the State Examining Board to again include the Code of Ethics in surveyor application forms.

(6) A proposed Fee Schedule had been sent to all members prior to the meeting. During the meeting a panel, consisting of Millard Smith (Tidewater), Bill Jett (Richmond), Walter Jones (Southern), George Hellwig (Northern) with Victor Ghent (Secretary, PSD-ACSM) as moderator, discussed fees and salaries in their respective areas of the State. Mr. Ghent noted the current study being made by ACSM and the Private Practive report just published by ASCE. Following the panel talks, discussion brought out further pertinent facts regarding fees and practices. The panel was appointed as a day committee to try to resolve the matter. Later in the day a resolution was adopted urging the members to use the proposed schedule for exploratory purposes during the year, and a committee to consist of two representatives from each area was authorized to work on the whole subject during the year and make what would be hoped to be a final recommendation to the membership at the 1960 Annual Meeting.

Following the luncheon, the Honorable Russell M. Carneal spoke to the group on Recent Rulings of the U. S. Supreme Court; Captain W. H. Bainbridge, U.S.C.&G.S. presented a talk on the State Coordinate System; Byron R. Hanke, Chief of the Land Planning Section of F.H.A., discussed F.H.A.'s Land Planning Program; and Wm. H. Baker, Jr., Vice President and Chief Title Officer of Lawyers Title Insurance Corporation, discussed Title Surveys and Surveyor Responsibility. All of the talks were received with great interest by the members. Time was also available to examine the exhibits of the various suppliers present.

Over 110 persons attended the evening banquet and entertainment which had been ably arranged by the Tidewater Chapter under the direct supervision of A. L. Cherry and E. Stuart Ball. The transit was won by Chas. H. Fleet & Associates of Richmond. Clifford Thorpe (Chairman, Instruments Division, ACSM) of Thorp-Smith, Inc., handled the raffling of other door prizes and the presentation of deskweight plumb bobs to outgoing President Robert Bartenstein and his brother, outgoing Secretary John Bartenstein. The brothers were given a standing ovation as the meeing was turned over to the new officers: *President,* Victor Ghent; *Vice President,* E. Stuart Ball; *Secretary,* Merlin McLaughlin; and Two-year Director, J. Williamson Clark.

It is noted that during Friday evening Vice President Ghent conferred with the newly formed Southern Chapter and spent several

[1] *See* SURVEYING AND MAPPING, January–March 1958, Vol. XVIII, No. 1, page 105.

hours of Saturday night with a group from the western part of the State who were forming the Western Chapter. Its "charter night" was set for April 4th. This makes a total of five chapters in the Association and helps complete chapter coverage for all parts of the State. It is also noted that a page in the minutes is to be set aside for noting the passing of C. H. Shapleigh, Joseph Berry, and Larry Smith.

Two weeks after the above meeting, the Northern Virginia Chapter of VAS (an affiliate of ACSM) held its Annual Meeting just a few miles from Mt. Vernon and on the eve of George Washington's birthday. Guests of the chapter included Arlington, Alexandria, and Fairfax officials, and Walter Dix, Executive Secretary of ACSM. VAS President Victor Ghent helped niche a little piece of surveying history in Virginia by installing his partner in business, Cecil Cross, as the President of the Northern Virginia Chapter.

Foreign Geodetic Surveys

The Philippines, Turkey, Brazil, Greece, and Japan have patterned agencies in varying degree after the Coast and Geodetic Survey of the U. S. Department of Commerce. Another, the Central Geographical Research Institute of the Republic of Korea, has sought the advice of the Coast and Geodetic Survey in organizing its functions.

N.C.S.—A.S.C.E.

The National Capital Section of the American Society of Civil Engineers sheduled its annual dinner meeting for 7:30 p.m., Tuesday, March 10, 1959, at the Shoreham Hotel in Washington, D. C. This brought their meeting into a close relationship with the combined meetings of the American Society of Photogrammetry and the American Congress on Surveying and Mapping. That this was done deliberately is apparent from the following quotation from the meeting notice sent out by NCS-ASCE:

"The American Society of Photogrammetry and the American Congress on Surveying and Mapping will be holding their Annual Meetings at the Shoreham Hotel March 8–14. Extensive exhibits related to those fields of activity will be on display there all day Tuesday, March 10 (to 8:00 P.M.). If you have no other opportunity to view them, we suggest that you plan on arriving at the hotel early for the ASCE dinner in order that you may spend some time inspecting these very interesting ASP-ASCM exhibits."

Brother B. Austin Barry, F. S. C., Associate Professor of Civil Engineering, Manhattan College, was the principal speaker at the dinner meeting—his subject, "Dawn of a New Day in Engineering."

Connecticut Valley Association of C. E. & L. S.

At the annual meeting of the Connecticut Valley Association of Civil Engineers and Land Surveyors, held February 23, 1959, the following officers were elected:

President—C. Edwin Anderson, 66 Vernon St., Springfield, Mass.

Vice President—Edward N. Chapdelaine, 1694 Main St., Springfield, Mass.

Secretary—Corwin H. Rose, 161 Sugarloaf St., South Deerfield, Mass.

Treasurer—Merton C. Smith, 31 Elm St., Springfield, Mass.

Director (3 years)—Edward A. Moe, Conway, Mass.

Directors (to Massachusetts Association of Civil Engineers and Land Surveyors)—Gordon E. Ainsworth, 2 Graves St., South Deerfield, Mass., and A. Phillips Bill, 289 Main St., South Deerfield, Mass. *Alternates:* C. Edwin Anderson and Corwin H. Rose.

—Corwin H. Rose
Secretary

MALSCE Affiliates

The Executive Committee of the Board of Directors of the American Congress on Surveying and Mapping, meeting in Washington, D. C., May 16, 1959, formally approved the application of the Massachusetts Association of Land Surveyors and Civil Engineers for affiliation with ACSM.

The Massachusetts Association of Land Surveyors and Civil Engineers is composed of five regional associations as follows: Cape Cod Society of Professional Engineers and Land Surveyors, Eastern Massachusetts Association of Professional Engineers and Land Surveyors, Central Massachusetts Association of Civil Engineers and Land Surveyors, Connecticut Valley Association of Civil Engineers and Land Surveyors and Berkshire County Association of Registered Land Surveyors.

Illinois Land Surveyors Conference

The surveyors of Illinois now have the advantage of belonging to a statewide association without the requirement of being a member of another group or having to reside in a particular location. At the Second Annual Conference of the Illinois Land Surveyors, a revised constitution was presented which makes possible the formation of local chapters and several types of memberships to provide for the several interest groups.

The Second Annual Illinois Land Surveyors Conference was sponsored jointly by the Illinois Society of Professional Engineers, the Illinois Registered Land Surveyors Association, the Society of Professional Land Surveyors, and the Department of Civil Engineering of the University of Illinois. One hundred eighteen men attended the three-day event on the Urbana campus on February 5, 6, and 7, 1959. The attendance was good, considering the miserable condition of the highways due to the recent ice storms.

The group was welcomed by Stanley H. Pierce, Associate Dean of the College of Engineering, and Arnold A. Lundgren, general conference chairman, at the opening luncheon.

During the Thursday afternoon session, Herbert L. Brantley, Chief, Aerial Surveys Branch, Illinois Division of Highways, spoke on "Monumentation of Highway Survey Lines." Mr. Brantley told of what is being done to preserve land corners during highway location. Donovan D. Anderson, also of the Illinois Division of Highways, gave a paper entitled "The Land Survey Grid, The State Coordinate Grid, and Monument Custodial Service." Mr. Anderson explained the origin and structure of the State Plane Coordinate System and expressed the need for more responsibility in perpetuation of the monuments. A lively question and answer period followed these two papers.

Also on Thursday afternoon, the group had the opportunity of hearing about and seeing colored slides of many new surveying instruments, including the new models of the Tellurometer and the Geodimeter. This enlightening display was presented by R. G. Watts, Watts Instrument Company, Columbus, Ohio.

In the evening, Albert Schmidt, Service Surveying & Engineering Co., Chicago, discussed "The Relationship Between Fees and Standards." Mr. Schmidt explained the need for being fair to clients as well as upholding a professional standard. Bruce B. Bort, Chicago Guarantee Survey Co., Chicago, spoke on "Legal Description Writing and Proper Verbiage." The questions of being "on" or "in" a line, parallel "to" or "with" a line, "commencing" or "beginning," etc., provided a thought-provoking time for all present.

Friday morning opened with a well-organized panel on right-of-way problems. The theme for this panel was "Liaison—It Pays Dividends." The panel was ably moderated by Roy A. Strobeck, Manager of Real Estate, Commonwealth Edison Co., Chicago. The four panelists each took the main theme from a different viewpoint, as follows: Dean A. Elsing, Isham, Lincoln & Beale, Chicago, took the *lawyer's* viewpoint; William A. Thuma, Chicago Title and Trust Co., took the *title* viewpoint; Larry F. Berbaum, Illinois Power Co., Decatur, expressed the *right-of-way agent's* viewpoint; and James F. Kelly, Cook County Highway Department, defended the *highway* viewpoint.

Later during the morning session, Arnold A. Lundgren gave a paper on the "Aims and Activities of a Statewide Surveyor's Organization." He explained how strength through unity would benefit the entire profession.

Friday afternoon, Frank Kaplan presided over the annual business meeting of the Illinois Registered Land Surveyors Association. Their revised charter was presented. New members from all over the State were invited. Conference business was also aired during the afternoon, with Arnold A. Lundgren presiding.

The annual banquet was staged Friday evening at the Urbana Lincoln Hotel. Under the toastmastership of Professor Winfield Eldridge, the ninety banqueters enjoyed a fine meal and were privileged to hear an inspiring talk on India by Harold W. Hannah, Associate Dean of the College of Agriculture, University of Illinois. Dean Hannah recently spent two years in India helping that country establish a "land-grant" system of colleges. His talk was beautifully illustrated with color slides.

Professor Harold J. McFarlan of the University of Michigan opened the Saturday morning session with a talk entitled "Education for Land Surveyors." Professor McFarlan deplored the present trend in civil engineering education and emphasized the urgent need for more training in the fundamentals. Charles S. Danner, of Urbana, spoke on "Photogrammetry for Land Surveyors." With the aid of many illustrations, Mr. Danner showed how aerial photographs saved time and dollars in many types of property surveys. Winding up the morning session

was a talk entitled "Applications of Electronic Computers to Land Surveying" given by Jerry C. McCall, Manager, Midwest Computer Service, Decatur. Mr. McCall explained some of the many computing services that can be performed on electronic computers.

Following lunch and after several miscellaneous committee meetings, the surveyors went their various ways, agreeing that the conference had been a success. All of the discussions were recorded, and, together with the papers and panels, will be published in the Proceedings, due to become available in July 1959.

—WINFIELD H. ELDRIDGE

Georgia Association of Registered Land Surveyors

The regular monthly meeting of the Georgia Association of Registered Land Surveyors was begun at 10:00 a.m., Saturday, March 7, 1959, at the Georgia Archives and History Building in Atlanta. The meeting was arranged to familiarize the membership with records available to surveyors and mappers. The meeting was conducted by Mr. Hitz, who is in charge of this type of records for the State of Georgia.

After the recess for lunch, the business meeting was held at a place announced during the morning session but not known to the writer.

—EDITOR

East Bay Council on Surveying and Mapping

EDITOR'S NOTE.—The following is based on a "Notice of Meeting" sent to the membership of the East Bay Council on Surveying and Mapping by J. D. Kelly, who signed the notice as "Acting Secretary." However, the letterhead on which the notice was printed lists Mr. Kelly as "Secretary."

The East Bay Council on Surveying and Mapping met in the Basement Conference Room of the Richmond City Hall at 1:30 p.m., March 11, 1959.

Following a series of committee reports and other miscellaneous business, old and new, a program was staged, which included the following talks and demonstration:

"Demonstration of Triangulation Light," by Mr. Ball of the New Flasher Company.

"City of Richmond's Mapping Program," by Louis Cunan.

"Alameda County Experience With the Subtense Bar," by Reuben Hurd.

Officers of the Council, as listed in the letterhead, are as follows:

General Chairman—R. B. Hurd
Vice Chairman—F. G. Cheney
Secretary—J. D. Kelly, P. O. Box 509, Martinez, Calif.

Minnesota Land Surveyors Association

The Minnesota Land Surveyors Association held its 7th Anuual Meeting, April 10–11, 1959, at Forest Lake Lodge, Grand Rapids, Minnesota.

President Percy Hosfield introduced Dean Anderson who gave the invocation and memoriam. Mayor Laurent and Chamber of Commerce Secretary Dear welcomed the group. Reports by President Hosfield, Secretary Georgi, and Treasurer Simonet were presented, followed by a two-day program of committee reports and papers on instruments, public waters, land planning and subdivision control, highway rights of way, photogrammetry in subdivision design, surveys bordering public waters, etc.

There were also reports and discussions from officials of the University of Minnesota, the Surveyor's Section of the Minnesota Society of Professional Engineers, the MSPE Insurance Program, the Registration Board, and a report on the 19th Annual Meeting of ACSM by Carlisle Madson.

Congress News

St. Louis Section

The St. Louis Section of the American Congress on Surveying and Mapping held its first 1959 meeting on February 6th as a joint meeting with the American Society of Photogrammetry. The meeting was planned and sponsored by the Educational Committee under Nelson Clark. A panel discussion dealt with the proposed "New Standards for Professionalism in Cartography" which have been creating much interest. Members of the panel were: Thomas C. Finnie, moderator, O. Jean Habermaas, Robert H. Kingsley, Paul P. Condaxis, and Leerie R. Summers. The attendance was good, interest ran high, and many entered into the discussion.

As a result of the discussion, several suggestions will probably be made for changes or modifications in the proposed Standards. Some persons will be affected by the Standards, whatever their final form, and this is inevitable because of differing backgrounds in education and experience. However, it is generally believed that the profession of Cartography will benefit from defining the term "professionalism," i.e., the stating of the criteria, or qualifications for a professional rating as a Cartographer.

Another meeting, held February 20th, was of much wider interest. Lieutenant David S. Boyd, Engineering Officer of the U.S.S. *Skate*, described the "Voyage of the *Skate* Below the Arctic Ice Pack." He gave us much detail on navigating by inertial guidance. The St. Louis Section of the Institute of Navigation was invited to join us for this meeting. The program was sponsored by the Committee on Cartography, under Gordon E. Stine.

On March 31, 1959, Duncan M. Fitchet of the Rand McNally Company, Chicago, Ill., and William C. Cude of the Engineer Research and Development Laboratories, Fort Belvoir, Va., both Directors of the ACSM, addressed a well-attended meeting of the St. Louis Section. The discussion period which followed the formal talks was lively and was enjoyed and participated in by the interested audience.

The Section's "Newsletter" will be under way before long.

—Sheridan L. Hall
Section Editor

Southern California Section

The annual ladies night, held December 5 at the Silver Saddle Inn, Downey, with some 70 members and wives attending, climaxed a successful year for the Southern California Section.

The evening's program included a fashion show conducted by Dorothy White, wife of the Section Editor for 1958, and two very fine films. The first was "Boat Trip Down the Colorado River" and the second was about the current problem of land subsidence in the Long Beach Harbor area.

Student Award memberships were presented to the following area students: Stephanie K. Stevens, Richard W. Reeves, Paul L. Schulte, and Ray A. Lunden.

—James W. Robinson
Section Editor

Colorado Section

Two meeting were held by the Colorado Section during the final quarter of 1958. The first, held on November 6 at the Denver Federal Center, featured a talk by Matt Walker, Chief of Surveys and Maps, Region 2, U. S. Forest Service. Mr. Walker discussed specifications for control and special problems encountered and how they were overcome in the Forest Service's program of mapping by photogrammetry. At the conclusion of his talk he showed a color movie, *Rainbow Valley*, portraying the life and duties of a Forest Ranger.

Section Chairman Emmett J. Coon reported on his trip to the Western Regional Meeting at Monterey, California, and then appointed a nominating committee for selection of candidates for 1959 officers. Members of the committee were J. E. Mundine, *Chairman*, and M. A. Harmel and G. M. Perham.

The second meeting, the final one for the year, was held on December 4, also at the Federal Center. New officers for 1959 were announced, as follows:

Stanley M. Borrell, *Chairman*
Harvey C. Fensten, *Vice Chairman*
Louis S. Soreide, *Sec.-Treas.*
I. H. Gessley, *Editor*

J. H. Dickinson of the engineering firm of Tipton & Kalmbach, Denver, was the featured speaker of the evening. In a paper entitled "The Harold D. Roberts Tunnel," he described the planning and digging of this tunnel, now being constructed to divert water from the Blue River eastward under the Continental Divide into the South Platte River for use by the ever expanding Denver water system.

—JOHN R. CLEMENS
Section Editor

Texas Section

The annual meeting of the Texas Section, held on December 5, 1958, attracted 67 members and guests to John's Restaurant in Houston. Like the three quarterly meetings held during 1958, this was a dinner meeting preceded by a cocktail hour.

Section Chairman Leonard E. Cornitius opened the meeting with introductions of guests. Annual reports were given by the Chairman and by the Treasurer, Howard E. Bush. Membership Chairman L. P. Carr reported the current membership of the Section was 231.

A report of the Tellers Committee indicated that the 1959 officers of the Section are as follows:

Tom Dillon, *Chairman*
C. J. Montgomery, Jr., *1st Vice Chairman*
Glenn E. Musselman, *2nd Vice Chairman*
Howard E. Bush, Jr., *3rd Vice Chairman*
Howard C. Taylor, *Secretary*
John H. Brownlee, *Treasurer*
James W. Terry, *Director*
B. D. King, Jr., *Director*

—TOM DILLON
Section Chairman

Northern California Section

EDITOR'S NOTE.—Probably as a result of a change of officers, we have received copy for two different reports on the NCS meeting of January 30, 1959. The first report was published in SURVEYING AND MAPPING, March 1959, Vol. XIX, No. 1, page 125. The second report was substantially the same as the first except for the following:

Complimentary memberships in the Northern California Section ACSM were presented to Ben Nakashima and Ben Gage. These memberships were awarded by the faculty of the Engineering Department of Fresno State College for outstanding work in the surveying courses at the College during 1958.

The meeting of March 24, 1959, was held jointly with the American Society of Photogrammetry at 8:00 p.m., in the Board Room of the Public Works Building, 1120 N Street, Sacramento, Calif.

A report on the consecutive meetings of ASP and ACSM in Washington was given by a panel, as follows: C. J. Aggeler, City College, San Francisco; Robert Colwell, University of California; Charles R. Strang, U. S. Geological Survey; Sidney Petersen, Aerial Photographer, Chico; C. L. Gundlach, U. S. Geological Survey; and L. L. Funk, California Division of Highways.

These panelists gave their impressions of the National meeting and/or the highlights of selected technical papers in a well balanced program of interest to some 70 people in attendance.

A new California Council of Civil Engineers and Land Surveyors educational motion picture on the role of civil engineers and land surveyors in subdivision planning was a special entertainment feature.

Joseph Williams discussed briefly some of the photogrammetric techniques used by Packard, Muir and Train in subdivision planning.

North Carolina Section

The 1959 annual meeting of the North Carolina Section was held in Charlotte, North Carolina, on Saturday, January 31, 1959, with Chairman Benjamin E. Kirkman presiding. Ten members were in attendance.

Secretary W. Thompson Cox reported that 350 letters had been mailed to surveyors registered in the State, as part of a membership drive. Each letter contained a résumé of the aims and purposes of the North Carolina Section, and invited the recipients to join ACSM and the Section. In furtherance of the membership drive, the Section decided, on motion of Robert Guarino, to appoint members in various parts of the State to contact prospective members in their areas and explain the aims of the Section as to standards of work, standard fees, and the problem of unethical competition.

The Section voted to adopt, for interim use, the Technical Standards for Surveying and Mapping and the Schedule of Standard Fees for Property Surveying Services of the Professional Engineers of North Carolina, to remain in effect until such time as a special committee can study and recommend changes that may be advisable.

W. Thompson Cox was appointed the official authorized representative of the Section to the ACSM 19th Annual Meeting in Washington.

The new Section officers and directors were installed. These officers and directors were listed in SURVEYING AND MAPPING, March 1959, Vol. XIX, No. 1, page 126.

W. THOMPSON COX
Secretary-Editor, NCS

Affiliation With F.I.G.

Acting upon 19th Annual Meeting resolution and subsequent action by ACSM Board of Direction, March 13–14, 1959, ACSM Secretariat has formally applied for affiliation with the Federation Internationale des Geometres (FIG), through its Secretariat in Delft, Netherlands.

Thanks

The American Congress on Surveying and Mapping takes this opportunity to publicly express its sincere appreciation to the Convention and Meetings Committee workers and participants responsible for preparing and presenting the 1959 ASP-ACSM Annual Meetings and Exhibit. You are to be commended for the very successful convention made possible by your splendid teamwork and cooperative effort. Thank you for a job so well done. Thanks also to the many behind the successful accomplishment, the exhibitors, the hotel and convention staff, the press, the members and officers of both the American Congress on Surveying and Mapping and the American Society of Photogrammetry, and in particular to ACSM's 19th Meeting Chairman, Captain John H. Brittain, and the ACSM Program Committee, and to the 1959 ASP-ACSM Convention Director, John H. Wickham, Jr., and his Deputies and Chairmen and their able staffs. Thank you all for the tremendous effort and a spirit of cooperation which made such a show possible.

By order of ACSM Board of Direction
WALTER S. DIX
Executive Secretary, ACSM
March 14, 1959

Personals

ACSM Past President **W. B. Williams** was the principal speaker at the Friday evening banquet, during the annual meeting of the Michigan Society of Registered Land Surveyors, at Traverse City, Michigan, February 12–14, 1959.

Gaylord H. Streeter, Chief, Nautical Chart Compilation and Maintenance Section, Coast and Geodetic Survey, retired on December 31, 1958, after 40 years' service with the Survey.

Kenneth E. Reynolds, formerly with the Bausch & Lomb Optical Company, became Executive Vice President, Wild Heerbrugg, Instruments, Inc., Port Washington, N. Y., on January 1, 1959.

Charles H. Davey has retired from his position as Atlantic Region Engineer, U. S. Geological Survey. His successor is **Charles F. Fuechsel,** formerly Chief, Field Surveys Branch, of the staff of the Chief Topographic Engineer, U.S.G.S.

W. H. Miller, a former Director of the American Congress on Surveying and Mapping, retired from his position as Director, Surveys and Mapping Branch, Department of Mines and Technical Surveys (Canada), on November 14, 1958. Mr. Miller had served with that organization or its predecessors since his graduation from Queen's University in 1914, with a degree of Bachelor of Science in Civil Engineering, except during the period from 1916 to 1919 when he was serving overseas with the 8th Battalion of the Canadian Engineers. He entered the service of the Government of Canada upon his graduation from the university and progressed during his career from Junior Topographical Engineer to Director of the Branch.

John C. Lipscomb retired on January 1, 1959, from the Pan American Petroleum Corporation after 24 years' service. His present address is 2510 Reba Drive, Houston 19, Texas.

Leo W. Ruth, Jr., 919 The Alameda, San Jose 26, California, a former director of the Northern California Section of ACSM, has been appointed by Governor Edmund G. Brown to

the State Board of Registration for Civil and Professional Engineers for a four-year term expiring January 15, 1963.

Fred B. Engelbrecht, Captain **Henry E. Finnegan,** and **Roy O. Williamson,** Coast and Geodetic Survey, were among those who received Department of Commerce Meritorious Service Awards during an Honor Awards Ceremony held in Washington, D. C., February 16, 1959.

Deaths

W. H. Miller, a Director of the American Congress on Surveying and Mapping in 1953 and 1954, died in Ottawa, Canada, on March 12, 1959, at the age of sixty-seven. His death occurred only three months after his retirement as Director, Surveys and Mapping Branch, Department of Mines and Technical Surveys of the Government of Canada.

Born in 1891 at Renfrew, Ontario, Mr. Miller graduated from Queen's University with a B.Sc. in Engineering in 1914. He served with the Canadian Engineers during World War I and won the Military Cross.

During his term as Director of the Surveys and Mapping Branch, Canada made some of its greatest strides in mapping and charting, especially in the north.

An authority on surveying both in Canada and abroad, Mr. Miller was technical adviser to the Colombo Plan Administration and was a member of the United States-Canadian Joint Committee on Defence Mapping.

He attended a meeting in Japan of the United Nations Regional Cartographic Conference for Asia and the Far East just prior to his retirement last year.

Mr. Miller is survived by his wife, Beatrix Marion; two sons, Charles and Donald; and a daughter Margaret.

Map Supplement to the Annals of the Association of American Geographers

A new venture in map publishing has been approved by the Council of the Association of American Geographers. The project, a Map Supplement to the Association's quarterly *Annals,* is intended "to provide a publication outlet in the Association for the cartographic portrayal of geographic data on a format larger than *Annals* page size. The Council is convinced that maps dealing with particular areas or subjects can be made to stand alone, requiring little or no explanatory text."

Richard Edes Harrison, well-known freelance cartographer and illustrator, has been appointed Editor of the *Map Supplement.* He is authorized to reject or accept maps submitted to him and, if the author is unsuccessful in obtaining funds to cover publication costs, the Editor may solicit funds for such purposes.

A leaflet, giving specifications for maps submitted for consideration, may be requested from the Map Editor at 313 East 51st Street, New York 22, N. Y.

—WALTER W. RISTOW

Library of Congress

Ship SURVEYOR Launched

The Coast and Geodetic Survey Ship *Surveyor* was launched April 25, 1959, with appropriate ceremonies, at the yards of the National Steel and Shipbuilding Company in San Diego, California. John J. Allen, Jr., Under Secretary of Commerce for Transportation, and Lloyd C. Fleming, Pacific Coast Director of the Maritime Administration, spoke at the launching ceremony. Mrs. H. Arnold Karo, wife of the Director of the Coast and Geodetic Survey, christened the *Surveyor* by breaking the traditional bottle of champagne on the bow of the ship.

EDITOR'S NOTE.—For details regarding this new ship, *see* "C. & G. Survey to Have New Ship," SURVEYING AND MAPPING, April–June 1958, Vol. XVIII, No. 2, page 161.

NEW MEMBERS

INDIVIDUAL MEMBERSHIPS

ADAMS, Gerald Benton, 2408 N.W. 16th Road, Miami, Fla.—Land Surveyor

ANDERSON, Oscar Maurice, 320 S.E. 7th Ave., Gainesville, Fla.—Land Surveyor

ANDERSON, William E., Box 11, Star Route West, Tillamook, Oreg.—County Engineer

ARBOGAST, Charles B., Jr., Box 277, Stuart, Fla.—Land Surveyor

ARMSTRONG, Clyde L., 3131 East Cypress St., Phoenix, Ariz.—Draftsman, Johannessen & Girand

ARMSTRONG, William N., 6528 East 22nd St., Tucson, Ariz.—Vice President, Maddock & Associates

ATTLEE, Arthur L., 450 Oakridge Ave., North Plainfield, N. J.—Land Surveyor

AYLETT, Sam G., 5210 Newton St., Merriam, Kans.—General Manager, James Bell & Associates

BABCOCK, John O., 708 Fourth St., N.W., Watertown, S. Dak.—Babcock Surveying Service

BAGSHAW, John H., 3104 North 45th St., Phoenix, Ariz.—Field Engineer, Salt River Power District

BAILIFF, Norman B., Bailiff & Butz, 8020 Fair Oaks Blvd., Fair Oaks, Calif.—Land Surveyor-Civil Engineer

BALCH, John N., Jr., 5F Eastway, Greenbelt, Md.—Cartographic Technician, Army Map Service

BALL, Glenn, 3005 Erie St., S.E., Washington 20, D. C.—Cartographer, U.S.C. & G.S.

BARTHELD, Robert A., 4084 West Eldorado Place, Denver 19, Colo.—Supervisory Cartographer, U. S. Forest Service

BASSHAM, Irwin L., 1434 North 35th St., Phoenix, Ariz.—Party Chief, Salt River Power District

BAUSCH, Carlton E., Jr., 43 Patten Ave., Oceanside, N. Y.

BENSON, Robert L., Route 2, Box 358, Portland 10, Oreg.—Timber Farmer

BENTLEY, F. B., Jr., 4905 East Windsor Ave., Phoenix, Ariz.—Engineering Department, City of Phoenix

BERKSTRESSER, V. K., 6406 Stratton St., Houston 23, Tex.—Engineer, Henry J. Johnson

BERLIN, Robert A., Folsom Road, Covington, La.—Surveyor

BETLEY, Chester J., 2001 Sixth St., N.E., Minneapolis 18, Minn.—Deputy Surveyor, Hennepin County

BIRGE, Oliver, Hessel, Mich.—Instrumentman for L. F. Levin

BISSIRI, August, Los Angeles City College, 855 North Vermont Ave., Los Angeles 29, Calif.—Instructor

BORGO, Philip E., Department of Engineering, Arizona State University, Tempe, Ariz.—Teaching Assistant in Engineering

BOWSER, Leonard D., 2820 Concord St., Colorado Springs, Colo.—Chief of Surveys, Skidmore, Owings & Merrill

BRALY, James Revis, 2251 S.W. 41st St., Miami, Fla.—Land Surveyor

BREED, David E., Crescent Bluff Ave., Branford, Conn.—Assistant Manager, New Haven Terminal

BRENIZER, Edmond R., 1029 North Coolidge Ave., Casa Grande, Ariz.—Surveyor

BROOKS, Floyd E., 518 North Rural Drive, Monterey Park, Calif.—Instrumentman, Los Angeles County Engineer

BROWN, Archie B., P. O. Box 752, Venice, Fla.—Land Surveyor

BROWN, James D., 314 North Main St., Crossville, Tenn.

BROWN, Joe E., 1530 West 4th Place, Mesa, Ariz.—Chief, Inspectors and Surveyors, City of Mesa

BROWN, Ralph Y., 853 Kearny Ave., Kearny, N. J.—Land Surveyor

BROWN, William T., 200 Exchange Bldg., Jacksonville, Fla.—Land Surveyor

BROWNELL, Edwin R., 2379 Coral Way, Miami, Fla.—Land Surveyor

BRUNER, William David, 106 Palm St., Titusville, Fla.—Land Surveyor

BRYANT, L. Chester, 39 South Fifth Ave., Tucson, Ariz.—President, Tucson Blueprint Co.

BURDEN, Thomas E., 1815 Broadway, Tucson, Ariz.—Thomas E. Burden & Associates

BURGESS, Fleetwood F., U. S. Geological Survey, P. O. Box 4197, Sacramento 21, Calif.—Cartographer

BURNS, Calvin B., 2304 Wilson Blvd., Arlington 1, Va.—Civil Engineer

BURRIDGE, John H., 9 Cornwall Ave., St. John's, Newfoundland, Canada—Director of Crown Lands and Surveys, Department Mines and Resources

BURTON, Edward Harry, 4239 Henderson Blvd., Tampa, Fla.—Land Surveyor

BUTTERFIELD, R. M., 2054 North 38th Place, Phoenix, Ariz.—Design Draftsman, Salt River Power District

BUTTS, James E., 1430 El Camino St., Phoenix, Ariz.—Supervisor of Survey Crews, Arizona Public Service Co.

CAMPBELL, Donald W., 918 North Martin St., Tucson, Ariz.—Field Engineer, Stevens, Pafford & Associates

CARLIN, Edwin, 117 West Sunrise Highway, Freeport, N. Y.

CARLSON, John R., 1635 Owens St., Box 81, Denver, Colo.—Cartographer, U.S.G.S.

CARTER, Egerton Everett, 1708 21st St., Vero Beach, Fla.—Land Surveyor

CASSON, John Edwin, 416 Haven St., Clearwater, Fla.—Land Surveyor

CASSON, Walter Andrew, Jr., 103 West Main St., New Port Richey, Fla.—Land Surveyor

CHAMBERS, Wayne R., 612 Howard St., San Francisco, Calif.—Manager, R. M. Towill, Inc.

CHAPMAN, Daniel D., 5200 Holli Lane, Fair Oaks, Calif.—Cartographer, U.S.G.S.

CHAPPELL, Fred R., 1104 South 11th East, Salt Lake City, Utah—Cadastral Surveyor, Bureau of Land Management

CHRISTIE, Stuart, 822 Laurita St., Linden, N. J.—Land Surveyor

CLARK, Howard, R., 1109 North Highland St., Arlington 10, Va.—Cartographer, U.S.G.S.

CLARK, James B., 1555 Marburd Way, Apt. 9C, San Jose, Calif.—Land Surveyor

CLARSON, Richard P., 420 First Federal Savings Bldg., Jacksonville, Fla.—Land Surveyor

CLAYTON, Jerry H., 1410 E. Hammond Lane, Phoenix, Ariz.—Party Chief, Salt River Valley Water Users' Association

COLEMAN, Ernest H., 270 Roberts Bldg., Jamestown, N. Y.—Land Surveyor

COMACK, Walter, U. S. Geological Survey, Bldg. 25, Federal Center, Denver 2, Colo.—Civil Engineer

CONNER, Joseph R., 3805 Camas St., Boise, Idaho—Photogrammetrist, Idaho State Highway Dept.

CONTZEN, Fred, 3732 East Hampton St., Tucson, Ariz.—Title Plant Engineer, Phoenix Title & Trust Co.

CORBETT, Thomas F., 25 East Central, Orlando, Fla.—Land Surveyor

COWHERD, William S., 22501 Friar St., Woodland Hills, Calif.— Party Chief, Los Angeles County Engineers

CROOK, Charles Davis, 4520 40th Ave., St. Petersburg, Fla.—Land Surveyor

CROUCH, Kenneth L., 2943 West Solano Drive, North, Phoenix, Ariz.—Surveyor, Arizona Public Service

CULBREATH, James Claude, 1005 Newman Drive, Leesburg, Fla.

DAHL, Donald D., 210 Edgewood Drive, Kalispell,

Mont.—Donald D. Dahl & Sons, Engineering Surveys

DANIELS, Albert G., 109 Chalmers St., Winnsboro, S. C.—Manufacturer of Drafting Instruments

DANIELS, Stoddard W., Route 3, Box 586, Golden, Colo.—Cartographer, U.S.G.S.

DARMSTATTER, Howard W., 59 Woodlot Road, Wayne, N. J.—Surveyor

DAVENPORT, Charles Leslie, 5804 Sunset Drive, South Miami, Fla.—Land Surveyor

DAVENPORT, George T., 453 North Ave., 56, Los Angeles, Calif.—Draftsman-Cartographer

DENES, Eugene, 288 N.W. 71st St., Miami 50, Fla. Land Surveyor

DERR, Robert M., 2880 South Vine St., Denver, Colo.

DESKINS, Thurman Henderson, Jr., 100 Avenue D, Fort Pierce, Fla.—Land Surveyor

DEUEL, Charles F., III, 104 7th St., South, St. Petersburg, Fla.—Land Surveyor

DEVINE, John P., 85 Piedmont St., San Francisco 17, Calif.—Engineering Technician, Corps of Engineers, U. S. Army

DICKINSON, H. J., 3037 Dexter St., Denver, Colo. —Construction Engineer, Tipton & Kalmbach, Inc.

DIONISIO, Alberto, 1318 Park Ave., Lansing, Mich. —Abrams Aerial Survey Corporation

DIVEN, John Allen, 11 St. Michaels Way, Baltimore 12, Md.—Engineer and Land Surveyor

DOBBINS, Malcolm R., 40 East Main St., Hohenwald, Tenn.—Engineer-Surveyor, M. R. Dobbins & Associates

DOUDNEY, Alfred C., P. O. Box 266, Sanford, Fla. —Land Surveyor

DOWLING, James Hamilton, P. O. Box 308, Tallahassee, Fla.—Land Surveyor

DRIVER, C. S., A. Lietz Co., 840 Post St., San Francisco, Calif.—Salesman

DUFFY, Donald A., 209 Gallo Bldg., 1685 3rd Ave., Prince George, B. C., Canada—Land Surveyor

DUNN, Herbert H., Holmquist Engineers, Phoenix, Ariz.—Party Chief

DURAND, H. C., 808 South Catalina St., Tucson, Ariz.—Surveyor, Durand & Dunn

EDWARDS, Andrew Wardlaw, P. O. Box 230, Lakeland, Fla.—Land Surveyor

ELBRECHT, Lawrence H., 3513 West Mariposa St., Glendale, Ariz.— Engineering Draftsman

ELLIS, Glenn, 2222 Vista Grande, Danville, Calif.

ETHERTON, E. A., Arabian American Oil Co., 505 Park Ave., Room 1524, New York 22, N. Y.— Supervisor of Administrative and Cartographic Division

EVANS, Robert Manning, P. O. Box 7, Ocala, Fla.— Land Surveyor

FARRINGTON, Glen Harris, 1732 Powers St., Lewiston, Idaho—Surveyor, Corps of Engineers, U. S. Army

FENGER, Ben A., 179 West Washington St., Chicago 2, Ill.—Land Surveyor, B. A. Fenger, Surveyors

FLANAGAN, Leaster G., 317 North Gadsden St., Tallahassee, Fla.—Land Surveyor

FLOWERS, Marshall Karnegy, 22 South Main St., Gainesville, Fla.—Land Surveyor

FOLLETT, Ralph L., 15 Ascot Drive, Eugene, Oreg. —Engineer and Surveyor

FORD, Jess B., 1774 West Flagler St., Miami, Fla. —Land Surveyor

FOSTER, H. E., P. O. Box 594, Brookhaven, Miss.— Civil Engineer, Mississippi State Highway Dept.

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Work of the Cartographic Division Soil Conservation Service

The Soil Conservation Service is the technical soil and water conservation agency of the Department of Agriculture. It is responsible for developing and carrying out a national program of conservation for land and water resources.

The Soil Conservation Service (SCS) administers Department of Agriculture activities involving technical assistance in soil and water conservation and flood prevention on private land. It gives technical information and services needed by other agencies in related programs.

The objectives of the national soil and water conservation program are: to achieve land use adjustments and treatment that will conserve soil and water resources; establish a more permanent and stable agriculture; reduce the hazards of flood and sedimentation; and assure the most productive long-term use of soil and water.

The Soil Conservation Service recognizes that the application of cartography is essential for carrying out its work and, accordingly, there is established within its organizational structure a division with responsibility for cartography. It is the functional duty of the Cartographic Division to furnish complete facilitating cartographic services for the Soil Conservation Service, including the compilation of soil maps for the National Cooperative Soil Survey, the furnishing of aerial photographs, drafting and reproduction services for farm and ranch planning, the compilation of large-scale topographic maps for special purposes, supplying engineering drafting services for watershed and flood prevention planning, and other essential cartographic assistance for such activities as irrigation and drainage work.

ORGANIZATION

The cartographic activities of the Soil Conservation Service are conducted at six locations: Beltsville, Maryland; Spartanburg, South Carolina; Milwaukee, Wisconsin; Fort Worth, Texas; Lincoln, Nebraska; and Portland, Oregon. These cartographic field branches are attached to the Washington staff and report through the Director, Cartographic Division, to the Assistant Administrator for Soil Survey. Each of the six field branches performs the main cartographic work needed by the service in a group of States. The Spartanburg office serves seven Southeastern States and Puerto Rico; Milwaukee serves nine Cornbelt States; Fort Worth, five Southern Great Plains States; Lincoln, the seven Northern Great Plains States; and Portland, the seven Far Western States, Hawaii and Alaska. The office at Beltsville, Maryland, serves the thirteen Northeastern States and, in addition, serves as national headquarters of the Cartographic Division and performs cartographic services for the Washington offices.

These branch cartographic offices have specially trained people and special equipment. By having a few centrally located field offices, a few people perform cartographic services economically with this equipment under the direction and supervision of a few highly competent specialists. In most cases one or two expensive pieces of equipment can handle all the work of a particular kind required for a number of States. The prompt use of cartographic services is an important factor in low costs of the work of the Soil Conservation Service, makes possible orderly planning, and conserves the time of field technicians on the job.

PRIMARY MAPPING ACTIVITY

The primary mapping program of the Soil Conservation Service is related to the responsibility of the U. S. Department of Agriculture in the field of soil survey. Mapping of soils in the United States began in 1899. This continuing program has provided published maps for approximately 1,700 areas during the last 58 years. The majority are now 25 to 30 years old and, therefore, represent what was known about the soils a quarter of a century or more ago. The general scale of the early soil maps was 1″ = 1 mile, and in most cases they were printed on large and often unwieldy sheets.

In recent years there has been an increasing demand for large-scale maps from which one can read accurately, in relation to local land lines, the kinds of soil in specific fields. Such maps are required for a variety of uses: farm and ranch planning in soil conservation districts; research and education programs of the Department and the State colleges; planning the agricultural phase of such programs as the Tennessee Valley Authority and the Bureau of Reclamation; tax assessment; predicting engineering problems on new highway construction; and the location of certain road building materials, such as gravel, sand, and clay. For many other activities, such as Soil Bank, the Great Plains

program, and the Agricultural Conservation Program, detailed soil maps are needed, on which individual fields may be recognized clearly.

To meet these demands, the Cartographic Division of the Soil Conservation Service made a comprehensive study about two years ago of the economics of producing maps of sufficiently large scale to meet the needs of all of these users. It was found that large-scale maps with an aerial photographic mosaic background could be produced by modern cartographic methods for considerably less than the older type, smaller-scale, colored maps. By using an aerial mosaic much drafting was eliminated, and at the same time a greater amount of background detail was included. The aerial mosaic shows such details as field boundaries, broad land use, minor roads or trails, and many others that could not be shown on a line base map.

It was recognized that after cultural and land-use changes occur the aerial mosaic will not agree exactly with existing conditions. However, if this is clearly understood by users, the location of individual fields will still be easier than with the old type line maps—especially in those parts of the country that do not have regular section lines. We also were aware that it would not be as easy to get a view of the whole county with this new atlas-type map as with the old smaller-scale, line maps, but this objection was more than balanced by the awkwardness of the large sheets for use in the field. By including in the soil-survey report a colored soil-association map, generalized from the detailed maps, we have in some measure provided a picture of the county as a whole with the colors distinguishing the outstandingly unlike soil boundaries.

A sample soil map for a county, incorporating these innovations, was produced and reviewed in the Department, in the Land Grant Colleges, and by a large group of soil-map users. We found that nearly all map users preferred soil maps on sheets small enough to be folded and bound in book form. We had presumed that this new type map would have its greatest advantage in areas that are not sectionalized, yet we found that users in the Midwest preferred it to the old line maps, even though location is fairly easy to establish on them. The Soil Conservation Service has adopted the new type map as standard, and the production program is now well under way.

These new type soil maps will have an aerial photo-mosaic background with soil boundaries and symbols overprinted in red. The scale of most of the detailed maps will be 1:20,000 (3.17″ = 1 mile) with sheets 11½″ × 15″, which, when folded and bound into the report, will produce an atlas 9¼″ × 11½″. Each atlas will also contain a small-scale, colored, soil-association map of the area.

It takes from 12 to 20 months for any one map to travel the cartographic production line from mosaic construction, through manuscript compilation and map finishing, to final lithography. To date, atlas-type reports with maps have been released for Houston and Washington counties, Tennessee, and Pasquotank county, North Carolina. Maps for fifty additional counties are now in various stages of preparation and should be coming off the presses soon.

These modern, large-scale, soil maps permit publication of practically all the detail mapped by the field surveyor, so we can transmit to all users the very latest scientific knowledge of the soil of a given area. The accompanying printed reports explain in detail the characteristics of the soils, the outline of alternative combinations of practices for adapted crops, and the consequences of these practices on both crop production and the long-time productivity of the soil.

USE OF AERIAL PHOTOGRAPHS AND PHOTOINTERPRETATION

During the past two decades technicians of the Soil Conservation Service have proved the aerial photograph to be indispensable in their work. Today, essentially all mapping work is done on aerial photographs furnished by the Cartographic Division. The photographs are used in the field for drawing soil boundaries and for plotting other data relevant to soil and water conservation plans for farms, ranches, watersheds, etc. In conservation planning, copies of the soil maps, made in the field, of individual farms are reproduced photographically in the Cartographic Units for each district cooperator. In addition, a blank copy of the aerial photograph covering the farm or ranch is photographically reproduced for use of the soil conservationist in arriving at a conservation plan with the operator.

The widespread use of aerial photographs in the Soil Conservation Service has made this agency a major user of photointerpretation. Photointerpretation has come to be generally recognized as a device for reducing the cost and improving the accuracy of most surveys and planning work which deals with the land. Here, again, the Cartographic Division performs a facilitating service by providing skilled

cartographers who serve as instructors in photo-interpretation at the SCS training centers. This training enables technicians to use photographs more fully in watershed protection, conservation planning, and everyday activities of soil surveying, engineering, forestry, etc.

Stero-plotting instruments are standard equipment in all of the units and are used mainly for the preparation of large-scale, special-purpose, close-interval topographic maps of widely scattered small areas. These are used in the planning and construction of specific engineering jobs, such as irrigation or drainage layouts, land leveling, watershed protection, and flood prevention structures. Most of this work is performed on very short deadlines to meet the immediate needs of an action program.

As the reader has seen, the term "cartography" in the Soil Conservation Service is used in its broad sense. It includes the primary mapping activity previously discussed, photogrammetry, geodesy, ground-control surveys for mapping and planning, arranging for aerial surveys, general drafting and engineering drafting services, documentary, photography, and reproduction of maps, charts, and other materials via lithography and direct printing processes. All of these services, as rendered by the Cartographic Division, aid and expedite the work of the some 10,000 Service technicians in the over-all job of soil and water conservation and flood prevention.

F. M. ORSINI
Director, Cartographic Division

USAF Global Navigation and Planning Charts

By RICHARD W. LAVERTY
CARTOGRAPHER*

Thirteen sheets of a recently developed "Global Navigation and Planning Chart Series" have been published by the USAF Aeronautical Chart and Information Center. The new series is designed primarily to fulfill the mapping requirement for greatly extended flight range capabilities, and increased speeds of contemporary aircraft and to facilitate the use of modern navigational equipment and techniques.

Twenty-six charts at a scale of 1:5,000,000 will be published to provide world coverage. The charts measure approximately 42 by 57½ inches and have the partial margin, strip-chart format. Vivid land tints, well distributed spot elevations, and skillfully executed shaded relief serve to present major landforms in a striking manner. Natural and cultural detail portrayed on charts of this series has been carefully selected so as not to introduce congestion or clutter.

Copies of the published Global Navigation and Planning Charts may be obtained for individual and educational use from the Director, U. S. Coast and Geodetic Survey, 14th and Constitution, N.W., Washington 25, D. C., at small cost.

* Headquarters, Aeronautical Chart and Information Center, Air Photographic and Charting Service (MATS), United States Air Force, Second and Arsenal Streets, St. Louis 18, Missouri.

Geographic Center of the United States Moves Again

That peripatetic entity, the geographic center of the United States, have moved again, now that Hawaii has or is about to become the fiftieth State.

We had not much more than finished chronicling its 439-mile step, which resulted from the admission of Alaska as the 49th State, when in comes Hawaii, and this interesting, though slightly mythical, point has hopped another 6 miles in a west-southwest direction from its position as of last July.*

Still in Butte County, South Dakota, the new position has been calculated by the mathematicians of the Coast and Geodetic Survey to be in latitude 44° 58′ North and longitude 103° 46′ West. The new position is approximately 17 miles west of Castle Rock, South Dakota.

Because the *possible* error in the new location is estimated to be as much as ten miles in any direction, this last jump of six miles does not seem to be too important. However, though Hawaii may be small, it has a good long lever arm and the geographic center must have moved at least a little bit. —EDITOR

* *See* SURVEYING AND MAPPING, October–December 1958, Vol. XVIII, No. 4, page 430.

International Yard and Pound

The following—released by the National Bureau of Standards of the U. S. Department of Commerce on January 1, 1959—is published in full in order that the portion of special interest to the surveying profession may not suffer for lack of background. —EDITOR

The Directors of the following standards laboratories:

Applied Physics Division, National Research Council, Ottawa (Canada)
Dominion Physical Laboratory, Lower Hutt (New Zealand)
National Bureau of Standards, Washington (United States of America)
National Physical Laboratory, Teddington (United Kingdom)
National Physical Research Laboratory, Pretoria (South Africa)
National Standards Laboratory, Sydney (Australia)

have discussed the existing differences between the values assigned to the yard and to the pound in different countries. To secure identical values for each of these units in precise measurements for science and technology, it has been agreed to adopt an international yard and an international pound having the following definition:—

the international yard equals 0.9144 metre;

the international pound equals 0.453 592 37 kilogramme.

It has also been agreed that, unless otherwise required, all non-metric calibrations carried out by the above laboratories for science and technology on and after July 1, 1959, will be made in terms of the international units as defined above or their multiples or submultiples.

The preceding announcement is being made concurrently by all the laboratories listed above. The following paragraphs provide explanatory material concerning the background and use of the new units within the U. S.

The international inch, derived from the international yard, is exactly equal to 25.4 millimeters. This value for the inch has been legally adopted by Canada. Also this value was approved by the American Standards Association for "Inch-millimeter conversion for industrial use" in 1933 (ASA Standard B48.1-1933), was adopted by the National Advisory Committee for Aeronautics in 1952, and has been adopted by many standardizing organizations in other countries.

At present for the calibration of line standards and end gages having nominal lengths expressed in inches, the National Bureau of Standards is using the inch defined by the Mendenhall order (Fundamental Standards of Length and Mass, Bulletin No. 26, United States Coast and Geodetic Survey by T. C. Mendenhall) published in 1893. The values corresponding to this order are approximately

1 yard = 0.91440183 meter;
1 inch = 25.4000508 millimeters.

These are derived from the exact relation

1 yard = 3600 ÷ 3937 meter.

The inch used by the National Physical Laboratory of the United Kingdom for its calibrations is defined by the equation

1 inch = 25.399956 mm.

It will be noted that the International Inch is approximately 2 parts per million shorter than the inch presently used by the National Bureau of Standards, and somewhat less than 2 parts per million longer than the inch now used by the National Physical Laboratory. To avoid possible confusion, during the transition period National Bureau of Standards calibrations of length or mass expressed in English units will embody a statement indicating clearly the unit which has been used if the choice introduces a significant difference in the calibration values. Furthermore, if the accuracy of the calibration is such that the certified values would be the same in either "International" units or the older units, the qualifying adjective "International" will not be used, i.e., the values will be expressed, for example, as so many inches or pounds.

The Coast and Geodetic Survey has requested the following exception with which the National Bureau of Standards concurs.

"Any data expressed in feet, derived from and published as a result of geodetic surveys, shall tacitly bear the relationship:

One foot equals 1200 ÷ 3937 international meter.

This relationship shall continue in being, for the purpose given herein, until such a time as it becomes desirable and expedient to readjust the basic geodetic survey networks in the United States, after which the ratio, as implied by the international yard, shall apply."

This unit shall be referred to as the American Survey Foot. Inasmuch as there is little or no interchange of survey data, where the foot measurements are used, with industrial and scientific data, where the international units will be used, it is anticipated that no confusion will result from this dual usage. For example, base line

surveys which might enter into a velocity of light determination would invariably be made in terms of meters.

The values of the pounds currently in use in the United States, United Kingdom and Canada are as follows:

1 U. S. pound	= 0.453 592 4277 kg
1 British pound	= 0.453 592 338 kg
1 Canadian pound	= 0.453 592 43 kg
1 International pound	= 0.453 592 37 kg

The relative differences in the various pounds are substantially less than in the yards but since masses can be measured with greater accuracy than lengths, the differences can be significant. The present British pound is about one part in ten million smaller than the international pound, whereas the U. S. and Canadian pounds are about one and one-half parts in ten million larger.

The conversion factor for the international pound was selected so as to be exactly divisible by 7 to give the following value for the grain:

1 International grain = .06479891 gram

The grain is the common unit in avoirdupois, apothecary, and troy pounds. There are 7000 grains in the avoirdupois pound, and 5760 grains in both the apothecary pound and the troy pound.

The standard U. S. gallon and the Imperial gallon are so substantially different that a compromise international gallon was not practicable. The U. S. gallon is defined as equal to 231 cubic inches. On the other hand the Imperial gallon is defined as the volume of 10 pounds of water under specified standard conditions. A fairly exact relationship is

1 Imperial gallon = 1.20094 U. S. gallons,

or less exactly

1 Imperial gallon = 6/5 U. S. gallons.

More About Surveying Safety on the Highway

By JOHN E. PAXTON, JR.

PROFESSIONAL ENGINEER-SURVEYOR[1]

In recent years it has become more and more hazardous for survey parties to work on public roads, due to the increase in the number of motor vehicles and the greater speeds at which they move. The surveyor must take extra safety measures to assure the protection, not only of personnel, but also of expensive equipment.

With the exception of the general use of "MEN WORKING" signs, of the standard 18- by 18-inch size, placed at the proper distance from the work area, there are no rules governing movement of traffic in areas where the survey parties are working. The table below shows suggested distances from the working area at which the signs should be placed. You will notice that the minimum distance is approximately twice the stopping distance necessary for the legal speed limit on the section of the road being surveyed. The proper use of these signs places the responsibility for an accident upon the operator of the motor vehicle and not upon the surveyor. This protects the surveyor from the possibility of having his insurance company drop him as a bad risk due to negligence.

Where the work of the surveyor interferes with the normal traffic flow, it is his responsibility to set up temporary traffic control. If he fails to do everything within reason for the safety of the motorist, as well as that of his own crew, he may be considered negligent. It must be remembered that, in most cases, the traffic will have to be controlled in both directions.

In cases where the location for the sign falls a short distance beyond the crest of a hill or the beginning of a curve, the sign should be moved back to a spot where it is clearly visible. However, the maximum distance should be no more than 1,000 feet from the work area. With an increase in the amount of traffic and an increase in the speed of travel, the number of signs should be increased. The number of signs required may be as many as seven or more. The odd sign should be set by the instrument, with the three in each direction spaced at equal intervals and facing the oncoming traffic. Each sign should be equipped to hold at the top corners two standard size 17- by 17-inch red and yellow flags. The yellow flag should be on the inside (toward the center of road) and the red flag on the outside. Tests have proved that yellow is the color most readily visible in all types of weather, and, because it is a *caution* color, it should be used on the side toward the traffic, with the red flag on the side on which the party is working. The signs should have

[1] 6410 Clearfield Street, P. O. Box 205, Rutherford Heights, Pa.

large black lettering on a yellow background and be supported at the top so as to swing free. Otherwise the wind will blow them over or they will be blown over when large trucks pass by.

The sign flags should have a piece of No. 12 copper wire stitched into the material, diagonally from the top to the outside bottom corner, to prevent "wrapping." Each man in the party should have a red flag for traffic control and for use in an emergency.

An extra piece of metal with the lettering "SURVEYOR," may be attached to the bottom of each sign in order to warn approaching traffic of the nature of work being performed. New signs are now available with the lettering "SURVEYORS AT WORK" or "SURVEYORS—PLEASE DRIVE CAREFULLY."

A standard 18- by 18- inch "SLOW" sign may be used when several signs are required, and it should be located following the first sign facing approaching traffic.

Traffic safety cones of rubber or plastic can play an important part in traffic control and safety, when used along with the signs. They are produced in heights ranging from 12 to 30 inches, have square bases, are easily cleaned, and are inexpensive. They are usually tipped with yellow and red, and they may be adapted for top mounting of flags, signs, or flashing red lights. They may also be secured with a reflectorized coating.

It is hoped that this article will help to set up much needed safety standards for the protection of any persons whose duties require them to work upon a public highway.

SPEED AND VEHICLE STOPPING DISTANCE

Speed (mph)	Minimum Vehicle Stopping Distance[2] (ft.)	Minimum Distance of Sign from Work (ft.)
20	40	150
30	73	160
35	95	200
40	115	250
50	166	350
60	226	450
70	295	600

[2] From Pennsylvania Digest of Vehicle Code and Student's Manual (Thinking time plus braking distance with perfect four-wheel brakes on good dry paved surface.)

The above table constitutes personal experience and is to be used as an example and adjusted as required for actual field conditions.

How Not to Catch the Scratch

This story, provided through the courtesy of North American Press Syndicate, Inc., has been included in this issue of SURVEYING AND MAPPING in the hope that it may be of interest to a considerable number of our readers whose work takes them into areas infested with poison ivy and poison oak. —EDITOR

Poison ivy and poison oak are found in 95 percent of all the counties in America, are much harder to recognize than most people think, and have characteristics that make these pestiferous plants one of the trickiest problems of outdoor life. Yet medical reports now state that this type of plant poisoning can be averted for almost everyone by means of a simple tablet which, taken in advance of the outdoor season, provides season-long immunity to both poison ivy and poison oak.

Eight out of ten people are more or less susceptible to poison ivy and poison oak, and one of the least known facts about poison ivy is also one of the strangest—instead of building up tolerance to ivy poisoning, we tend to become increasingly susceptible to it with each exposure.

Another peculiarity of these poisonous plants is their ability to poison you even though you never touch the plant. It is a resinous oil on the leaves that causes the rash, blisters, and itching. Touch something on which the oil has rubbed off, and enough of the oil may be transferred to your skin to start the rash. A dog that has run through poison ivy, a rake, a hoe, a shoe, or even the cuff of your trouser leg—any of these may be a "carrier" of the oil that causes the trouble.

Can you avoid direct contact with these plants? Unfortunately, no, unless you are a good botanist. Though the leaves always grow in groups of three, their shape varies widely. Moreover, poison ivy itself changes its shape. It may grow as a climbing vine, but it may also appear as a ground creeper or even as a bush. Poison ivy and poison oak take on so many different forms that not even the expert botanists agree on the number of existing species.

Folklore reveals some bizzare ideas on how to clash with the rash. A group of Indians, itching to avoid poison ivy, tried to placate the plant by

dubbing it "my friend." Another Indian tribe tried the brave approach—tribesmen *ate* poison ivy leaves. Did they suffer? You said a mouthful!

A vastly more effective, if less colorful, solution to the problem was announced in December 1958 in a report presented before a clinical meeting of the American Medical Association. This report stated that, according to clinical tests, a new product, Aqua Ivy Tablets, developed by doctors at New York University Bellevue Medical Center and the Albert Einstein College of Medicine, had provided more than nine out of ten clinical subjects with immunity to poison ivy. This was after the tablets had been taken orally for as short a period as six weeks. Tested on volunteer Boy Scouts and on Coast Guardsmen stationed along ivy-infested stretches of the Mississippi River, the tablets proved to be effective in establishing immunity that lasted for at least ten months. Aqua Ivy Tablets are reported to be without toxicity or other unpleasant side effects. Today they can be purchased at any drug store without medical prescription.

Although complete immunization is, of course, the best way to deal with poison ivy and poison oak, certain other precautions are recommended to those who have not yet built up an immunity. Here are four useful ideas:

(1) If you touch poison ivy or poison oak before you are immunized, scrub yourself with hot water and an alkali (strong brown soap is best), repeating the process at least three times. Decontaminate pets in the same way, but be sure to use rubber gloves. Clothing that has come in contact with these poisonous plants should be dry cleaned before being worn again —but you had better warn the unsuspecting dry-cleaner!

(2) If you own your own home, do your best to make sure you are not harboring any poisonous vines, creepers, or bushes on the premises. Don't try to weed them out with your bare hands! Use a plant killer of some sort which will kill the roots as well as the herbage.

(3) Don't burn poison ivy or poison oak if you can help it. Many homeowners unwittingly rake up the leaves of these poisonous plants with other garden trash or gather some dead tendrils of poison ivy along with their fire wood. The poisonous element in the plant does not die when its leaves wither and drop off. The poisonous oil vaporizes when burned. Carried by heat radiation or smoke, it can attack dozens of people in the vicinity. Remember that, even if you and your family are immunized, others may not be.

(4) If you should catch poison ivy or poison oak, watch out when the blisters break. This causes open sores that may be dangerous because of bacterial infection. Anyone with a really severe case of poison ivy or oak poisoning should see a doctor. Though poison ivy and poison oak take on many forms, of this you may be sure—they can never be confused with a bed of roses!

Carelessness, Indifference, and Incompetence

Among the hundreds of releases which pass over the desk of the editor of SURVEYING AND MAPPING, there is one now and then which causes him to sit up and take notice. Definitely in this class is the following release, prepared by Norbert W. Haley, Director of Public Relations, Manhattan College, New York 71, N. Y. We reproduce it in its entirety in the hope that we may be able to contribute to the improvement of a bad situation. We have had considerable experience in teaching both elementary and advanced surveying in various schools and summer camps, and we are willing to state categorically that in the last decade or so there has developed a lamentable lack of interest, on the part of many, yea *most*, students, in wrong signs, "wandering decimal points," accuracy of arithmetic calculations, etc., etc., ad nauseam. —EDITOR

"Graduates who are taking their places in industry are characterized more now than ever before by general carelessness and a spirit of nonchalant incompetence."

This was the opinion expressed recently by the national president of the American Society of Civil Engineers, Francis S. Friel, in speaking to one thousand alumni and students of the School of Engineering at Manhattan College in New York (at a Corporate Communion Breakfast, Sunday, March 15, 1959). Friel is president of Albright and Friel, Inc., a consulting engineering firm in Philadelphia.

Friel made his observation even though the "facilities of education have progressively improved, and while both the quality of instruction and the caliber of aspirants to the professions have risen."

"Nowhere beyond the classroom does the happy state of affairs exist where seventy percent is a passing grade," he said. "If students

are satisfied with a problem or project that is seventy percent correct, let me assure them that industry and the professions will not be."

Friel pointed out that industry and the professions expect one hundred percent performance. "Industry and the professions also expect students to be expending one hundred percent efforts in their studies now," he added.

The Civil Engineers president indicated that it has been the experience of his firm that "many fine young people are incapable of representing us until after we have provided them with further training, especially in writing and speaking." He said, "Time has been lost and efficient operation has suffered until these men have learned how to transfer accurate technical knowledge into clear, concise, written and spoken reports."

"If a student is making no effort now to improve his oral and written expression, if he lacks tact and courtesy in human relations, he should realize that his education will be neither complete nor valuable until he has done all in his power to acquire these indispensable qualities."

Considering the present scientific revolution which is "gaining momentum with each decade," Friel maintained that ideas have become more crucial tools in many cases than things. "We shall have to think our way to the solution, and on the basis of a sound knowledge of the interplay between science, social structures, political systems, and divergent philosophies."

The speaker declared that the most challenging problem now facing industry and the professions is the development of leaders for the future in both the technical and management fields. The type of leadership to be expected will depend not only on the quality of formal education a man receives but also on post-college training. "The college graduate cannot continue his formal education indefinitely on a full-time basis," Mr. Friel said, "nevertheless, he must continue his studies during his entire life."

Friel declared that after graduation, a person must set his own objectives. "He must establish a program of development, which will help him to grow professionally and as steadily as he did in college. It is in the first few years after graduation that he either gets the habit of growing on his own or he settles down into a routine of mediocre assignments."

He said the principal purpose of a college education is "to establish a firm foundation on which you can continue to build throughout your lifetime."

New C. & G. S. Observatory at Honolulu

As a center for magnetic observations and as the heart of the seismic sea wave warning system in the Pacific, the Honolulu Magnetic and Seismological Observatory is scheduled for completion about December 1959. To be located on a 175-acre tract located about two miles west of the entrance to Pearl Harbor, the new observatory will include a modern building for use as an office, laboratory, and workshop; four houses; and seven observatory buildings, four to house magnetic instruments and three for seismological instruments.

In addition, a sensitive pickup unit, located in the Waianae Mountains about eight miles from the new observatory, will feed information on tiny earth movements to the observatory's recording device by means of short wave radio signals.

The old observatory, located at Barbers Point about seven miles west of the new location, must be abandoned because of magnetic disturbances caused by the erection of an oil refinery nearby.

The buildings will ocupy about 42 acres of the 175-acre tract but will be located near the center of the area, as an added precaution against artificial magnetic disturbances.

George Washington— Father of Party Wall Rights

By J. C. COPPINGER*

IT IS GENERALLY accepted that no one can build a party wall on neighboring property without the consent of the owner of the adjoining land. This consent is usually in the form of a party wall agreement, duly executed, acknowledged and recorded in the public records of the locality.

However, due to a regulation issued by Presi-

dent George Washington in the early days of the Republic, such is not the case in the District of Columbia. From the creation of the Federal City, as the City of Washington was first called, down to the present day, an owner of land is given the right to enter upon his neighbor's land without permission from adjoining land owner, and build a party wall, one half on his land and one half on the land of his neighbor. Furthermore the neighbor can not use the party wall until has has reimbursed the first builder one half of the cost of so much of the wall as he shall use.

The history of this law of party walls in Washington, D. C., is unique and is fully set out in the Case of Cappalletti v. Auerbach, The Washington Law Reporter, Vol. 78, page 101, decided in 1949 readings as follows:

"1. The history of the law of party walls in Washington is interesting . . . The Original proprietors of the land in the Federal City conveyed it in trust . . . Under the trust provisions, the lots to be sold or distributed were to be subject to such terms and conditions as might be thought reasonable by the President for regulating the materials and manner of the buildings and improvements. President Washington issued regulations, one of which is in force today. They provided that a person appointed to superintend buildings might enter on the land of any person to set out the foundation and regulate the walls to be built between party and party, as to the breadth and thickness thereof, that the foundations were to be laid equally upon each lot and to be of the breadth and thickness thought proper by the superintendent, that the first builder was to be reimbursed one half of the cost of the wall, or so much thereof as the next builder might use, but that such use could not begin 'til he had paid the amount fixed by the superintendent. This has been held to be a condition annexed to every house lot in the original Washington. It has been decided to be the only source of the right of a lot owner in Washington to put this party wall on his neighbor's land."

From 1837 down to the present the application of this regulation laid down by our first President has resulted in other interesting Court decisions involving rights under the law of party walls in the District of Columbia. Some of them are as follows:

In 1837, it was decided that, after erecting a party wall between two lots, where the owner conveys one of them, such conveyance, unless there are express words of reservation, conveys the right to use the party wall, Goldschmidt v. Starring, 5 Mackey (16 D. C.) 582.

A few years later the Court held that: the building regulations (adopted in 1791) of the District of Columbia, as distinguished from the "Federal City" but of which the "Federal City" and Georgetown are now parts thereof, provided that a person desiring to build may construct a party wall on his own land and that of the adjoining owner, and that before the adjoining owner can use such wall, he must pay one half of the cost of so much as he shall use. Corcoran v. Nailor, 6 Mackey (17, D. C.) 580.

1892. Where a wall is built in a row of houses, the purchaser of each house acquires a half interest in the division wall as a party wall, irrespective of the dates of purchase and the fact that one of the houses runs further back than the other. Bartley v. Spaulding, 21 D. C. 47.

1903. One who desires to use a party wall, built partly on his lot and partly on his neighbor's lot, in accordance with the building regulations of the District, may use the wall for the whole or a part of its length, paying for the portion he uses; or he may use it all, and prolong it in either direction, within the limits of the regulations. Hutchins v. Munn, 22 App. D. C. 88.

1912. The fact that a lot owner has placed less than one half of the wall upon his neighbor's land will not preclude the latter from using the wall as a party wall. Kosack v. Johnson, 38 App. D. C. 62.

1915. Under a regulation or status requiring a lot owner, making use of a party wall partly on his lot, to pay the builder of the wall for such use, the claim of the builder for such compensation is a mere personal one, creating no interest in the property or the wall, adverse to the adjoining owner. Fowler v. Kochler, 43 App. D. C. 349, Ann. Cas. 1916 E, 1161.

So it would seem that, in addition to being the Father of our Country, George Washington is the father of the party wall doctrine that prevails in the District of Columbia.

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* Branch Manager, Washington, D. C.

EDITOR'S NOTE: The following article appeared in the *Lawyers Title News*, Vol. XIII, No. 2, February 1958, and is reprinted by permission.

A CATALOG OF CATALOGS

Bausch & Lomb Optical Company has made it easy for persons interested in optical equipment to select the exact catalog to fit their informational requirements.

Optical Products is a 24-page, illustrated index which lists current Bausch & Lomb catalogs. It is divided into consumer, ophthalmic, and scientific and technical products classifications, corresponding to the major product divisions of the Company. This permits catalogs of allied products to be grouped together for quick, easy reference. Each catalog entry includes a cover illustration and brief descriptive data. A factual account of the contents is included and each catalog number is specified.

A product index in the back of the book permits the reader to select the proper catalog by product reference. A copy of *Optical Products* can be obtained by writing to Bausch & Lomb Optical Company, 635 St. Paul Street, Rochester 2, N. Y., specifying Catalog L-86.

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BREVITY IS THE SOUL OF WIT

One of the most concise communications ever to come to the notice of this writer was received at the Central Office of the ACSM early in April 1959. It read:

"Gentlemen: Received questionnaire on geodetic surveys today. Have 3 yr. old son. Need new questionnaire. Thank you."

—EDITOR

NEW LITERATURE

A new, four-page, illustrated folder describing the features and accessories of the Micro-Master 105mm photo reproduction system for engineering drawings is available. Ask for "Micro-Master folder 25883-5M" and address request to Keuffel & Esser Co., Adams and Third Streets, Hoboken, N. J.

RECOMMENDED READING

An editorial bearing the title, "Surveying Is Engineering," (*Engineering News-Record,* Vol. 162, No. 10, March 12, 1959, page 100) which deals with the A. S. C. E. Task Committee's report on the Status of Surveying and Mapping.

MAPPING ADDIS ABABA

The municipality of Addis Ababa, capital of the Ethiopian Empire, is to be mapped from the air by Hunting Aerosurveys Limited. The new maps will be at scales of 1:2,000 and 1:4,000 and will cover an area of more than 500 square kilometers. The maps are to be used for replanning and development of the capital city.

DOUBLE RIGHT ANGLE PRISM

Keuffel & Esser Co., has added to its line of surveying equipment a Double Right Angle Prism which enables the user to place himself on line between two points and, at the same time, to establish a perpendicular to that line. The new instrument consists of two pentaprisms firmly cemented together and protected by a two piece metal cover. A simple twist of the cover reveals the prisms for use. The lower part of the hollow handle is grooved to accommodate a plumb bob. The device can be mounted on a staff if desired.

ACSM Objectives and Organization Study

During the year ending in March 1959, a study of Sections and Affiliates was carried out by a committee under the chairmanship of Professor Ralph Moore Berry. In the final report of that committee to the Board of Direction there were recommendations which would have required organizational changes in the American Congress on Surveying and Mapping.

It was concluded that before any changes be made in the policies relative to Sections and Affiliates, or before any organizational modifications be considered, a more basic study of objectives be undertaken. This should cover not only objectives of the ACSM as a national society but also those of its local segments and related organizations. Only when these are fully stated and generally accepted is it justified to consider organizational changes of any kind.

The concurrent study of ACSM–ASP cooperation, discussed on page 259 of this issue of SURVEYING AND MAPPING, also makes it desirable to take no action prior to determination of ACSM policy in that matter. Findings and conclusions of the ACSM–ASP Study Committee need to be constantly examined with respect to their possible effect on the objectives and organization of the ACSM, so close coordination of the work of the two committees has been arranged.

Chairman of the special ACSM Objectives and Organization Committee is Robert H. Lyddan, Past President of ACSM. His address is: c/o U. S. Geological Survey, Room 5236 G.S.A. Bldg., Washington 25, D. C.

Comments and correspondence from individuals, local sections, and affiliated associations are desired by the chairman and committee members.

1959 Western Regional Conference, ACSM

Under the sponsorship of the Southern California Section of the American Congress on Surveying and Mapping, the 1959 Western Regional Conference and Exhibit will be held at the Statler-Hilton Hotel, Los Angeles, California, October 29–31, 1959. This Western Regional Conference is expected to attract engineers and surveyors from the western States, including Alaska and Hawaii. Present plans call for holding the midyear meeting of the Board of Direction in Los Angeles during this Conference

General Chairman for the Conference is J. R. Finley, and further information may be obtained by writing to him at 1908 West Beverly Blvd., Los Angeles 57, Calif.

Lagoon Preserved 500 Feet Under Water

A perfectly formed barrier spit, with a lagoon inside it and a channel running down the lagoon, has been discovered by oceanographers of the Coast and Geodetic Survey. Such formations are common along the coast, but this one is 150 miles at sea and 500 feet under water.

The spit is a curving ridge 65 miles long, in the Gulf of Mexico west of Key West, Fla. Its existence was revealed in a study just completed by George F. Jordan and Dr. Harris B. Stewart, Jr., of a detailed hydrographic survey made over the continental shelf southwest of Florida. They have named the formation Howell Hook in honor of Commander J. A. Howell, a Survey officer who in 1872 took the first depth soundings in the area.

APPLICATION FOR MEMBERSHIP

I am interested in surveying and mapping and hereby apply for membership in the American Congress on Surveying and Mapping. I enclose $5.00 (U. S. and Possessions), $6.00 (Foreign) in payment of annual dues.

Name (Please type or print) .....

.....

Mailing Address .....

.....

Occupation and Organization .....

.....

Branches of surveying and mapping preferred .....

.....

Reference. If registered, please indicate .....

.....

Applicant's Signature ..... Date .....

(Send to: Chairman, Membership Committee, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.)

Reprints of Articles

Reprints in quantities of 50 or more may be obtained of any article appearing in this issue. Orders must be placed with the Editor-in-Chief, Howard S. Rappleye, 6712 4th St., N.W., Washington 12, D. C., not later than 3 weeks after publication. Authors who wish reprints of their articles may so indicate when manuscripts are submitted. Approximate prices of reprints follow:

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NOTE: THE PERCENTAGES SHOWN HEREON ARE DERIVED PARTIALLY BY COMPUTING ANSWERS ON QUESTIONS AND PARTIALLY BY EVALUATION OF COMMENTS. HENCE VALUES ARE REFLECTED TO THE NEAREST 5% ONLY.

NOTE: IN READING THIS CHART, ONE SHOULD TAKE CARE IN APPLYING KEY LETTERS AND ABBREVIATIONS. PLEASE REFER TO THE PRINCIPAL "KEY COLUMN" AND ALSO THE KEY LETTERS INDICATED IN EACH QUESTION COLUMN.

NOTE: THIS CHART IS TO BE USED IN CONJUNCTION WITH THE
IS PRESENTED TO THE PROPERTY SURVEY DIVISION DURING
INFORMATION HEREON IS NOT INTENDED TO REPRESENT COMPL
STATE, BUT IS INTENDED TO REPRESENT A RESULT OF THE
BEST AVAILABLE INFORMATION AND IS MONTHS OF VIGOROUS

KEY:

* INDICATES EVIDENCE OF STATE FEE SCHEDULE

\+ INDICATES EVIDENCE OF LOCAL FEE SCHEDULE IN INDIVIDUAL AREAS OF STATES.

AV..... AVERAGE

M.M.....MINIMUM–MAXIMUM

I.I.....INSUFFICIENT INFORMATION

HR..... HOURLY

INCL.... INCLUSIVE

INDIV...INDIVIDUAL

MIN.....MINIMUM

HR.CHGPR. HOURLY CHARGE PREVAILING

P.S. PUBLIC FEE SCHEDULE RECOMMENDATION

	RATIO OF AVERAGE HOURLY CHARGE FOR 3-MAN CREW COMPARED WITH DIRECT SALARY COST FOR 3-MAN CREW.	COMMENTS NOTED FROM SURVEYORS	1	2	3	4	5	6	7	8	9	10	11
			SALARY AS NOW PAID BY YOU OR AS PAID IN YOUR AREA										
			PRINCIPALS	SENIOR PARTY CHIEF	PARTY CHIEF	INSTRUMENT MAN	HEAD CHAINMAN	CHAINMAN	RODMAN	PRINCIPAL ASSISTANT (OFFICE)	DRAFTSMAN	COMPUTORS	APPRENTICES
ALABAMA +	2.000	INDICATE DESIRE FOR LOCAL FEE SCHEDULE	$5.25 HR.	$2.50 HR.	$2.25 HR.	$1.87 HR.	$1.50 HR.	$1.25 HR.	$1.25 HR.	$2.25 HR.	$1.87 HR.		
ALASKA	2.400	INTEREST IN RAISING PROFESSIONAL STANDARDS	I.I.		$4.00 HR.	3.75 HR.	3.50 HR.	3.25 HR.	3.00 HR.	3.00 HR.	4.00 HR.	3.50 HR.	3.00 HR.	2.50 HR.
ARIZONA	2.000	EQUITABLE FEES NEEDED	$7.50 HR.	2.75 HR.	2.50 HR.	2.00 HR.	1.75 HR.	1.50 HR.	1.50 HR.	2.50 HR.	2.25 HR.	2.50 HR.	1.50 HR.
ARKANSAS	2.314	UNABLE TO OBTAIN EQUITABLE RURAL FEES	I.I.	$3.00 HR.	AV. 2.50 HR. M.M. 1.67-2.50	2.00 HR.	AV. 1.90 HR. M.M. 1.25-2.00	1.40 HR.	1.30 HR.		2.50 HR.	3.00 HR.	1.00 HR.
CALIFORNIA + (FEE SCHEDULE – SANTA CLARA, SAN FRANCISCO, LOS ANGELES, MONTEREY, SACRAMENTO, SAN DIEGO)	UNION 2.011 NON-UNION 2.027	PUBLIC EDUCATION ON SURVEYING ENCOURAGED	$250 WK. M.M. $166-350	AV. 3.50 HR. M.M. 3.51	AV. 3.51 HR. M.M. 2.45-3.98	AV. 3.00 HR. M.M. 2.75-3.10	AV. 2.65 HR. M.M. 2.00-3.00	AV. 2.50 HR. M.M. 1.75-2.61	2.50 HR.	AV. 3.50 HR. M.M. 3.00-3.75	AV. 2.85 HR. M.M. 2.50-3.00	AV. 2.75 HR. M.M. 2.00-2.95	AV. 1.90 HR. M.M. 1.75-2.00
COLORADO	1.864	HIGHER FEES NEEDED	$500 HR.	$100.00 MONTH	2.50 HR.	2.30 HR.	1.90 HR.	AV. 1.60 HR. M.M. 1.50-1.75	1.60 HR.	$100.00 MONTH	AV. 2.50 HR. M.M. 2.00-3.00	2.50 HR.	1.50 HR.
CONNECTICUT +	2.250 METROPOLITAN AREA ONLY	INDICATE HIGHER FEES DESIRED	$ 4.00 HR.	3.00 HR.	2.75 HR.	2.50 HR.	1.75 HR. RURAL 1.50	1.50 HR.	1.50 HR.	1.75 HR.	2.25 HR.	2.25	
DELAWARE	2.088	SUGGEST CHARGE EXPENSES PLUS 100%	$ 5.00 HR.	AV. 3.00 HR. M.M. 2.40-3.60	AV. 2.65 HR. M.M. 2.00-3.00	1.85 HR.	1.85 HR.	1.50 HR.	1.50 HR.	3.00 HR.	2.50 HR.	2.85 HR.	1.25 HR.
FLORIDA +	2.385		I.I.	$2.40 HR.	2.10 HR.	1.80 HR.	1.30 HR.	1.25 HR.	1.25 HR.	3.00 HR.	1.80 HR.	2.50 HR.	1.00 HR.
GEORGIA * + (SEE GEORGIA ASSOC. LAND SURVEYORS FEE SCHEDULE)	2.295		I. I.	$ 3.00 HR.	2.50 HR.	2.00 HR.	1.50 HR.	1.25 HR.	1.25 HR.	2.50 HR.	2.00 HR.	1.75 HR.	1.00 HR.
NOTE- GEORGIA ASSOC. OF REG. LAND SURVEYORS PRESENTED FIGURE SHOWN THUS (+) AS REPRESENTING MINIMUM													
IDAHO	2.295	COMPLAINT PUBLIC EMPLOYEES CUTTING FEES IN SPARE TIME WORK	$4.00 HR.	3.00 HR.	2.50 HR.	1.85 HR.	1.50 HR.	1.25 HR.	1.25 HR.	2.50 HR.	2.00 HR.	2.00 HR.	1.25 HR.
ILLINOIS + (SEE "SOCIETY PROF. LAND SURVEYORS" FEE SCHEDULE)	2.980	SOME AREAS ENCOURAGE HIGHER FEES	I.I.	$3.25 HR.	2.50 HR.	AV. 2.10 HR. M.M. 1.95-2.50	AV. 2.00 HR. M.M. 1.75-2.25	AV. 1.75 HR. M.M. 1.25-2.00	1.50 HR.	2.25 HR.	2.25 HR.	2.25 HR.	AV. 1.50 HR. M.M. 1.25-1.80
INDIANA * (SEE IND. SOCIETY PROF. LAND SURVEYORS FEE SCHEDULE)	2.500	COMPLAINT PUBLIC ENCOURAGE CUTTING FEES IN SPARE-TIME WORK	$5.00 HR.	I.I.	2.50 HR.	2.00 HR.	1.85 HR.	1.65 HR.	1.65 HR.	2.00 HR.	1.75 HR.	1.85 HR.	1.35 HR.
IOWA * (SEE IOWA ENGINEERING SOCIETY FEE SCHEDULE)	2.051	RAISING OF PROF. STANDARDS ENCOURAGED	$5.00 HR.	4.00 HR.	2.50 HR.	2.25 HR.	1.75 HR.	1.65 HR.	1.50 HR.	2.00 HR.	1.75 HR.	1.75 HR.	1.40 HR.
KANSAS	2.225	NEED CLOSER CO-OPERATION BETWEEN SURVEYORS	$750.00 MONTH	550.00 MONTH	495.00 MONTH	395.00 MONTH	295.00 MONTH	260.00 MONTH	250.00 MONTH	500.00 MONTH	395.00 MONTH	350.00 MONTH	1.25 HR.
KENTUCKY	2.500	ATTEMPTS BEING MADE AT LOCAL ORGANIZATION OF SURVEYORS	$ 3.50 HR.	2.50 HR.	2.25 HR.	2.00 HR.	1.50 HR.	1.25 HR.	1.25 HR.	2.00 HR.	1.85 HR.	1.85 HR.	1.00 HR.
LOUISIANA (ANSWERS REPRESENT METROPOLITAN AREAS ONLY)	2.867		I. I.	3.00 HR.	2.50 HR.	1.75 HR.	1.50 HR.	1.25 HR.	1.25 HR.		2.00 HR.	2.00 HR.	1.00 HR.
MAINE	1.300	NON-VOLUME PART-TIME	I. I.	$3.50 HR.	3.00 HR.		1.50 HR.	1.50 HR.	1.50 HR.				1.00 HR.

N CONJUNCTION WITH THE WRITTEN COMMITTEE REPORT WHICH URVEY DIVISION DURING THE MARCH 1959, MEETING. THE D TO REPRESENT COMPLETELY THE PRACTICE IN A GIVEN SENT A RESULT OF THE COMMITTEE'S STUDY BASED ON THE 18 MONTHS OF VIGOROUS RESEARCH.

FEES & SALARIES STU

BY PROPERTY SURVEY DIVISION - A.C.S.M

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9	10	11		A	B	C	D	E	F	G		H		I		J	K	L	
EA			ARE YOU OR YOUR EMPLOYEES MEMBERS OF A SURVEYORS OR ENGINEERS LABOR UNION. ?	IS MOST OF YOUR WORK ON A FIXED (F) OR HOURLY (H) FEE ?	DOES YOUR AREA OPERATE UNDER A SCHEDULE OF MINIMUM FEES FOR SURVEYS ?	WHO SPONSORED YOUR SCHEDULE OF MINIMUM FEES STATE OR LOCAL ?	DO YOU BELIEVE SURVEYORS IN YOUR AREA ARE FOLLOWING AN ADEQUATE SCHEDULE OF MINIMUM FEES ? INDIV. = INDIVIDUAL SURVEYOR SCHEDULE	DO YOU FOLLOW MINIMUM SCHEDULE IN YOUR PRACTICE ? INDIV. = PERSONAL FEE SCHEDULE	DO YOU SUBMIT FIRM PRICE BIDS TO CLIENTS FOR SURVEYS ? ALWAYS (A) NEVER (N) DEPENDS ON TYPE OF WORK INVOLVED (D)	FEE FOR PROPERTY STAKING EXISTING PLATTED RESIDENTIAL PROPERTY		FEE FOR PROPERTY STAKING EXISTING PLATTED BUSINESS PROPERTY		FEE FOR STAKING RURAL PROPERTY		BASIS OF CHARGE FOR METES AND BOUNDS DESCRIPTION, HOURLY (H) PER ACRE (A)	FEE FOR COURT TESTIMONY AND OTHER LEGAL PROCEEDINGS, MINIMUM PER DAY (M) HOURLY (H)	FEE FOR LOCATION OR IMPROVEMENT SURVEY (NO PROPERTY STAKES SET)	
DRAFTSMAN	COMPUTORS	APPRENTICES								MINIMUM	AVERAGE	MINIMUM	AVERAGE	MINIMUM	AVERAGE			BUSINESS LOT	RESIDENTIAL LOT
$1.87 HR.			NO	H 100%	YES 5% NO 95%	LOCAL	YES 5% NO 95%	U.	D 100%	AV. $20.00 M.M. 18-22	AV. $25.00 M.M. 20-30	AV. $30.00 M.M. 25-35	$40.00	$25.00	$30.00	H 100%	AV. M $50.00 M.M. 25-60	HOURLY CHARGE PREDOMINANT	$15.00
3.50 HR.	3.00 HR.	2.50 HR.	NO	F 50% H 50%	NO 100%		NO 100%	YES 100% (INDIV.)	D 100%	50.00	AV. 80.00 M.M. 75-125	80.00	AV. 100.00 M.M. 75-150	80.00 HOURLY CHARGE PREDOMINANT		H 100%	H 10.00	HOURLY CHARGE PREDOMINANT	
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AV. 2.85 HR. M.M. 2.50-3.00	AV. 2.75 HR. M.-M. 2.00-2.95	AV. 1.80 HR. M.-M. 1.75-2.00	YES 85% NO 15%	F 21% H 79%	YES 72% NO 28%	6 LOCAL AREAS	YES 28% NO 72%	YES 71% NO 29%	A 7% N 21% D 72%	AV. UNION $ 65.00 NON-UNION 40.00	AV. UNION 80.00 NON-UNION 50.00	AV. UNION 100.00 NON-UNION 70.00	AV. UNION 150.00 NON-UNION 75.00	90.00	200.00	H 100%	AV. M 75.00 M.-M. 25-150	AV. 100.00 M.-M. 50-150 HOURLY CHARGE PREDOMINANT	AV. 70.00 M.-M. 40-100
AV. 2.50 HR. M.-M. 2.00-3.00	2.50 HR.	1.50 HR.	NO	F 35% H 65%	NO 100%		NO 100%	YES 10% (INDIV.) NO 90%	A 15% N 15% D 70%	AV. $ 22.50 M.-M. 1350-35	AV. 25.00 M.-M. 20-45	AV. 30.00 M.-M. 25-65	35.00	45.00 HOURLY CHARGE PREDOM.	HOURLY	H 100%	AV. M 75.00 M.-M. 50- 100	25.00	AV. 12.50 M.-M. 10-20
2.25 HR	2.25		NO	F 20% H 80%	YES 20% NO 80%	LOCAL	YES 20% NO 80%	N.A.	N 75% D 25%	$50.00	65.00	100.00	150.00	HOURLY		H 50% $65.00 1 ST ACRE $25.00 EACH ADDL. ACRE	M 75.00	100.00 HOURLY CHARGE PREDOMINANT	60.00
2.50 HR.	2.65 HR.	1.25 HR.	NO	H 100%	NO 100%		NO 100%	YES 90% (INDIV.) NO 10%	A 30% N 30% D 40%	$ 20.00	30.00	25.00	35.00	35.00	50.00	H 100%	AV. 50.00 M.M. 40-100	100.00 HRLY. CHG PREDOM.	AV. 50.00 M.M. 30-75
1.80 HR.	2.80 HR.	1.00 HR.	NO	F 50% H 50%	YES 20% (LOCAL) NO 80%	LOCAL 20%	YES 20% NO 80%	YES 20% NO 80%	N 10% D 90%	AV. $ 35.00 M.-M. 20-35	AV. 35.00 M.M. 30-50	AV. 60.00 M.-M. 50-75	AV. 70.00 M.M. 35-100	HOURLY		H 100%	AV. M 85.00 MIN. 35.00	AV. 50.00 M.-M. 25-100	AV. 25.00 M.-M. 15-50
2.00 HR.	1.75 HR.	1.00 HR.	NO	F 50% H 50%	YES 75% NO 25%	STATE 100%	YES 20% NO 80%	YES 100%	D 100%	$60.00 + M.-M. 25-80	80.00 + M.M. 20-85	120.00 + M.-M. 90-120	90.00	HOURLY 100.00 + 200.00 + PER MILE OF LINE		HOURLY	AV. M 90.00 MIN. 30.00	HOURLY	20.00
THUS (+) AS REPRESENTATIVE FEES																			
2.00 HR.	2.00 HR.	1.25 HR.	NO	F 50% H 50%	YES 10% NO 90%		NO 100%	YES 50% (INDIV.) NO 50%	N 30% D 70%	$ 22.00	AV. 25.00 M.M. 20- 30	25.00	50.00	35.00 HOURLY CHARGE PREDOMINANT		H 100%	AV. M 100.00 M.M. 50-100	35.00	25.00
2.25 HR.	2.25 HR.	AV. 1.50 HR. M.-M. 1.25- 1.80	NO	F 25% H 75%	YES 80% NO 20%	LOCAL (SEE CHICAGO AREA)	YES 50% NO 50%	YES 70% NO 30%	N 25% D 75%	AV. $ 40.00 M.-M. 30-50	AV. 50.00 M.-M. 40-70	AV. 50.00 M.-M. 40-60	70.00	60.00 (HOURLY CHARGE PREDOMINANT)	150.00	H 100%	M 80.00 H 10.00	AV. 40.00 M.-M. 25-80 HRLY. CHG. PREDOM.	AV. 25.00 M.-M. 17-35
1.75 HR.	1.85 HR.	1.35 HR.	NO	F 40% H 60%	YES 30% NO 70%	STATE	YES 50% NO 50%	YES 65% NO 35%	N 50% D 50%	$ 35.00	35.00	40.00	40.00	40.00	HOURLY CHARGE PREDOM.	MAJORITY HOURLY $ 3.00 PER ACRE	M 80.00 ES. 100.00	HOURLY CHARGE PREDOMINANT	
1.75 HR.	1.75 HR.	1.40 HR.	NO	F 10% H 90%	YES 40% NO 60%	STATE	YES 40% NO 60%	YES 80% NO 20%	N 15% D 85%	AV. $ 35.00 M.-M. 15-40	40.00	HOURLY FR. 125.00	HOURLY	HOURLY		H 100%	M 80.00	HOURLY CHARGE PREDOM.	25.00
385.00 MONTH	350.00 MONTH	1.25 HR.	NO	F 85% H 15%	NO 100%		YES 10% (INDIV.) NO 90%	YES 60% (INDIV.) NO 40%	D 100%	AV. $ 25.00 M.M. 1250-40	AV. 35.00 M.M. 1250-65	AV. 40.00 M.M. 25-50	50.00	50.00	100.00	H 100%	AV. M 100.00 M.M. 50-100	30.00	AV. 15.00 M.M. 12-20
1.85 HR.	1.85 HR.	1.00 HR.	NO	H 100%	NO 100%	NONE	NO 100%	INDIV. SURVEY SCHEDULE YES 50% NO 50%	D 100%	$ 15.00	20.00	40.00	50.00	HOURLY		H 100%	M 80.00	30.00	25.00
2.00 HR.	2.00 HR.	1.00 HR.	NO	F 50% H 50%	SOME INDICATION OF INDIVIDUAL SCHEDULES (U.)	U.	U.	U.	N 50% D 50%	AV. $ 40.00 M.M. 28-65	45.00	AV. 75.00 M.M. 40-150	65.00	HOURLY		H 100%	M 80.00	AV. 75.00 M.-M. 60-150	AV. 50.00 M.-M. 40-65
		1.00 HR.	NO	F 10%	NO 100%		NO 100%	YES 50% (INDIV.)	N 40%	HOURLY CHARGE PREDOMINANT						H 100%	AV. H 3.50 M 80.00	30.00	35.00 HOURLY

RIES STUDY

EY DIVISION - A.C.S.M.

...S THIS CHART ARE RESERVED BY
...URVEYING AND MAPPING."

J	K	L		M	N			O	P				QA		Q1
BASIS OF CHARGE FOR METES AND BOUNDS DESCRIPTION, HOURLY (H) PER ACRE (A)	FEE FOR COURT TESTIMONY AND OTHER LEGAL PROCEEDINGS, MINIMUM PER DAY (M) HOURLY (H)	FEE FOR LOCATION OR IMPROVEMENT SURVEY (NO PROPERTY STAKES SET)		FEE FOR COMBINATION PROPERTY SURVEY AND IMPROVEMENT SURVEY.	RECOMMENDED HOURLY CHARGE FOR FIELD WORK			RECOMMENDED HOURLY CHARGE FOR SERVICES OF —				TOPOGRAPHIC SURVEY CHARGE PER ACRE FOR GRID METHOD (G) STADIA METHOD (S) PLANE TABLE METHOD (P)	WHAT IS CONSIDERED STANDARD PROPERTY MONUMENTS IN YOUR AREA (P) PIPE (I) IRON BAR (S) STONE (W) WOOD (A) AXLE (C) CONCRETE MONUMENT				AVERAGE NUMBER OF LOTS PER SUBDIVISION IN INDIVIDUAL AREA	PERCENTAGE OF SURVEYORS USING HOURLY (H) AND FIXED (F) PRICE IN SUBDIVISION SURVEYS	TOPOGRAPHY MAP
		BUSINESS LOT	RESIDENTIAL LOT		2-MAN CREW	3 MAN CREW	4-MAN CREW	PRINCIPALS (P) CHIEF ASSISTANT (A)	COMPUTOR (C) DRAFTSMAN (D)	CLERICAL (C) OFFICE APPRENTICE (AP)			RESIDENTIAL LOT CORNERS	NEW SUBDIVISION LOT CORNERS	NEW SUBDIVISION EXTERIOR CORNERS	BLOCK CORNERS			
H 100%	AV. M $80.00 M.M. 25-50	HOURLY CHARGE PREDOMINANT	$15.00 CHARGE PREDOMINANT	L.L.	$150 HR.	AV. $100 HR. M.M. 7.50-12.50	AV. $12.00 M.M. 10-15	P $8.00 A 10.00	C $9.00 D $9.00	L.L.	G $25.00 S 80.00 P 15.00	I 10% P 90%	I 10% P 90%	C 20% P 80%	C 10% P 90%	40	L.L.	$5.00
H 100%	H 10.00	HOURLY CHARGE PREDOMINANT			$150	$4.00	30.00	P 10.00 A 10.00	C 9.00 D 9.00	L.L.	HOURLY	L.L.	L.L.	L.L.	L.L.	L.L.	L.L.	
H 100%	M 75.00	50.00	30.00	HOURLY CHARGE	6.50	11.50	15.00	P 7.00 A 5.00	C 3.50 D 4.00	C 1.75 AP 1.75	HOURLY FEE	P 100%	P 100%	C 100%	P 100%	L.L.	L.L.	$15.00
20.00 1 ST ACRE 500 EACH ADDL ACRE MR,CH,PR.	AV. M 40.00 M.M. 25-40	20.00	AV. 20.00 M.M. 30-35	AV. 30.00 M.M. 30-35	9.00	13.50	15.00	P 4.50 A 4.00	C 3.00 D 3.00	C 2.00 AP 2.00	G 7.50 S 7.50 P 7.50 MR,CH,PR.	I 100%	I 100%	I 80% C 80%	I 80% P 90%	40	L.L.	$10.00
H 100%	AV. M 75.00 M.M. 25-150	AV. 100.00 M.M. 90-150 HOURLY CHARGE PREDOMINANT	AV. 70.00 M.M. 40-100 HRLY. CHG. PREDOM.	AV. 150.00 M.M. 90-220 HRLY. CHG. PREDOM.	AV. UNION 14.00 NON-UNION 15.50 M.M. 8-18	AV. UNION 17.50 NON-UNION 19.00 M.M. 10-25	AV. UNION 20.00 NON-UNION L.L.	UNION P 12.50 NON-UNION P 300 A 9.00	C & D 6.50 M.M. C & D 6.00-8.00	C & AP 4.00 M.M. C & AP 2.00-6.00	HOURLY FEE	W 50% P 50%	W 65% P 35%	C 14 % P 86%	C 7% P 93%	AV. 40 M.M. 8-100+	H 90% F 10%	
H 100%	AV. M 75.00 M.M. 50- 100	25.00	AV. 12.50 M.M. 10-20	30.00	8.00	AV. 11.00 M.M. 10-12.00	AV. 15.00 M.M. 13-16	P 7.00 A 5.00	C 5.00 D 4.00	C 3.50 AP 3.50	HOURLY FEE	I 70 % P 30 %	I 70 % P 30%	I 80% P 10 % A 10%	I 75% P 15% A 10%	80	H 10% F 90%	$3.50
H 80% $65.00 1 ST ACRE 2500 EACH ADDL ACRE	M 75.00	100.00 HOURLY CHARGE PREDOMINANT	50.00 CHARGE PREDOMINANT	L.L.	AV. 10.00 RURAL M+A 6.00-8.00	13.50	23.00	P 10.00 A L.L.	C 2.50 D 2.50	L.L.	G (M.-M.) 25-100 S (M.-M.) 15-75	L.L.	L.L.	L.L.	L.L.	L.L.	HOURLY CHARGE	
					NOTE: REPORTS FROM RURAL AREAS INDICATE EXTREMELY LOW FEES													
H 100%	AV. 60.00 M.M. 40-100	100.00 HRLY. CHG. PREDOM.	AV. 60.00 M.M. 30-75	100.00	9.50	12.00	15.00	P 9.00 A 7.00	C 6.00 D 4.00	C 3.00 AP 2.00	G 35.00 S 50.00 P 80.00 MR,CH,PR.	W 10% P 90%	W 10 % P 90%	C 90% P 10%	C 90% P 10%	125.00	L.L.	5.00
H 100%	AV. M 85.00 MIN. 35.00	AV. 50.00 M+M. 25-100	AV. 25.00 M+M. 15-50	AV. 55.00 M+M. 30-80	AV. 9.50 M+M. 6-10	AV. 11.00 M.-M. 9.75-12.50	AV. 14.00 M.-M. 10-15	P 10.00 A 6.00	C 6.00 D 4.00	C 2.50 AP 3.00	G 30.00 S 10.00 P 7.00	W 25% I 50% P 25%	W 25% I 25% P 50%	C 100%	C 75% P 25%	AV. 100 M.M. 25-500	H 80% F 20%	$3.50
HOURLY	AV. M 50.00 MIN. 30.00	HOURLY	20.00	30.00	AV. 9.50 M.M. 6-12	AV. 12.00 M.M. 9-15	15.00	P 7.50 A 6.00	C 3.00 D 3.00	C 3.00 AP 3.00	G $500+ 20.00 HRLY. S HRLY. P	I 100%	I 100%	I 25% C 75%	I 25% C 75%	50	H 80% F 20%	$ 2
H 100%	AV. M 100.00 M.M. 50-100	35.00	25.00	35.00	AV. 9.00 M.M. 8-10	12.00	14.00	P 6.00 A 5.00	C 4.00 D 4.00	C 3.00	HOURLY CHARGE PREDOM.	I 50% P 50%	I 50% P 50%	I 50% C 10% P 40%	I 50% P 50%	50	H 100%	
H 100%	M 80.00 H 10.00	AV. 40.00 M+M. 25-80 HRLY. CHG. PREDOM.	AV. 25.00 M.-M. 17-35 HRLY. CHG. PREDOM.	50.00 HOURLY CHARGE PREDOM.	AV. 13.50 M.-M. 9-15	AV. 16.50 M.-M. 12-25	23.50	P 9.00 A 8.00	C 7.50 D 6.00	C 5.00 AP 5.00	G 15.00 S 10.00 P 5.00 HRLY. CHG. PREDOM.	I 50% P 50%	I 50 % P 50 %	C 50% P 50%	C 50 % P 50%	L.L.	H 90 % F 10 %	
MAJORITY HOURLY $ 3.00 PER ACRE	M 80.00 H.S. 100.00	HOURLY CHARGE PREDOMINANT		35.00 HOURLY CHARGE PREDOM.	10.00	15.00	19.50	P 7.00 A 6.00	C 5.00 D 5.00	C 2.00 AP 2.00	G 10.00 HOURLY CHARGE PREDOM.	I 100%	I 100%	C 100%	C 100 %	60	H 80% P 20%	$5.00
H 100%	M 50.00	HOURLY CHARGE PREDOM.	25.00	50.00 HOURLY CHARGE PREDOM	AV. 10.00 M.M. 7.50-10	AV. 12.00 M.M. 10-15	15.00	P 6.00 A 5.00	C 3.50 D 4.00	C 3.00 AP 3.00	G 50.00 S 35.00 HOURLY CHARGE PREDOM.	I 30% P 70%	I 30 % P 70 %	I 20 % P 80%	I 20% P 80%	40	H 90% F 10%	
H 100%	AV. M 100.00 M.M. 50-100	30.00	AV. 18.00 M.M. 12-30	AV. 40.00 M.M. 30-50	AV. 10.00 M.M. 9-12.50 RURAL 6.00	AV. 15.00 M.M. 12-18 RURAL 7.00	18.00	P 10.00 A 7.50	C 6.00 D 5.00	C 3.00 AP 3.00	G 12.50 S 10.00 P 7.50	W 10% I 90%	W 10% I 90%	I 100%	I 100%	100	H 75% F 25%	$2.00
H 100%	M 50.00	50.00	25.00	30.00	L.L.	12.50	15.00	P 9.00 A 6.50	C 5.00 D 4.00	C 3.00 AP 3.00	G 50.00 HOURLY CHARGE PREDOM.	W 50 % I 50%	W 50 % I 50%	I 100%	I 100%	L.L.	L.L.	
H 100%	M 50.00	AV. 75.00 M.M. 50-150	AV. 50.00 M.M. 40-95	L.L.	AV. 11.00 M.M. 10-12.50	15.00	L.L. 20.00 INDICATED	P 9.00 A 7.00	C 6.00 D 5.00	C 4.00 AP 4.00	HOURLY	I 50% P 50%	I 50% P 50%	I 50% P 50%	I 50% C 50%	L.L.	H 100%	
H 100%	AV. M 5.50 M+M.	50.00	35.00	HOURLY	7.50	9.00		P 5.00			HOURLY	I 50% P 10%	I 50% P 10%	L.L.	L.L.	L.L.	H 100%	

FEES AND S

CHAIRMAN.... JAMES L
VIC GHENT, ANNANDALE, VIRGINIA
DUDLEY C HOWARD, DALLAS, TEXA
PHILLIP KLINE, OVERLAND PARK,

QA		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	
AVERAGE NUMBER OF LOTS PER SUBDIVISION IN INDIVIDUAL AREA	PERCENTAGE OF SURVEYORS USING HOURLY (H) AND FIXED (F) PRICE IN SUBDIVISION SURVEYS	AVERAGE FEE PER LOT OR HOUSE FOR—														
		TOPOGRAPHY MAP	PRELIMINARY PLAT AND EXHIBITS	BOUNDARY SURVEY	FINAL PLAT	STREET DESIGN	FINAL ROAD DRAINAGE AND UTILITY PLANS	SEWER PLANS	PRELIMINARY STREET STAKING	SPECIFICATIONS	STAKING AND GRADING: SANITARY SEWERS	STAKING AND GRADING: STORM SEWERS	STAKING AND GRADING: CURBS AND SIDEWALKS	INSPECTION	DESIGN SITE GRADING PLAN REQUIRED BY F.H.A.	GRA... PER ORDER
40	i.i.	$5.00	$1.50	$ 10.00	$ 6.00	← PERCENTAGE AND HOURLY CHARGE →									i.i.	$ 17.5
i.i.	i.i.	← PRACTICE IN THIS FIELD OBVIOUSLY LIMITED →														$ 50.0
i.i.	i.i.	$15.00	10.00	15.00	15.00	HOURLY FEE FOR FIELD WORK AND PERCENTAGE CHARGE FOR DESIGN										50.0
40	i.i.	$10.00	15.00	10.00	10.00	10.00	20.00	%	3.00	%	4.50	4.50	4.50	%	8.00	10.0
AV. 40 M.M. 8-100+	H 90% F 10%	← HOURLY CHARGE PREDOMINANT														
80	H 10% F 90%	$3.50	2.00	8.00	3.00	← 4.00 INCL. →		4.00	7½¢ PER FOOT OR $30 PER LOT	i.i.	9¢ PER FOOT	14¢ PER FOOT	9¢ PER FOOT	HOURLY	15.00	20.0
i.i.	HOURLY CHARGE	← HOURLY CHARGE →							10¢ PER FOOT	HOURLY	10¢ PER FOOT	10¢ PER FOOT	10¢ PER FOOT	HOURLY	i.i.	35.0 HOUR
125.00	i.i.	5.00	5.00 (5.00 PER ACRE EVIDENT)	15.00	10.00	5.00	AV. 10.00 M.M. 5-15	%	5.00	%	5.00	5.00	10.00		10.00	25.0
AV. 100 M.M. 25-500	H 80% F 20%	$3.50	3.50	6.00	5.00	5.00	5.00	5.00	5.00	INCL.	10.00	10.00	10.00		i.i.	AV. 35.0 M.M. 10-3
50	H 80% F 20%	$ 25.00 INCL.		i.i.	i.i.	100.00¢ PER MILE	250.00 PER MILE	%	250.00¢ PER MILE	i.i.	i.i.	i.i.	i.i.	i.i.	25.00	25.0
50	H 100%	← $30.00 INCL. →				← HOURLY AND PERCENTAGE CHARGE →										
i.i.	H 90% F 10%	← HOURLY AND PERCENTAGE CHARGES →													$10.00	20.0
60	H 80% F 20%	$5.00	← 50.00 INCL. →		25.00	%	%	%	5.00	%	← HOURLY →			%	HOURLY	←
40	H 90% F 10%	← $ 30.00 INCL. →				%	%	%	HOURLY	%	← HOURLY →			%	HOURLY	AV. $25.0 M.-M. 20-75
100	H 75% F 25%	$2.00	5.00	10.00	5.00	75.0 % OWN. PREDOM.	5.00	10.00	7.00	INCLUDED	10.00	5.00	10.00	7.50	10.00	AV. 20.0 M.M. 10-3
i.i.	i.i.	← $ 20.00 INCL. →			← 40.00 INCL. →			15.00	5.00	INCLUDED	5.00	5.00	5.00	INCLUDED	10.00	25.0
i.i.	H 100%	← HOURLY CHARGE PREDOMINANT →														
i.i.	H 100%	← HOURLY CHARGE PREDOMINANT →														

FEES AND SALARIES COMMITTEE

CHAIRMAN.... JAMES L. BELL, PRAIRIE VILLAGE, KANSAS
ANNANDALE, VIRGINIA (SEC OF PROPERTY SURVEY DIVISION) PAUL P RICE, NEW BRUNSWICK, NEW JERSEY
WARD, DALLAS, TEXAS NEWELL B SNOW, BUZZARDS BAY, MASSACHUSETTS
, OVERLAND PARK, KANSAS C A WOOLRIDGE, CARMEL, CALIFORNIA

	Q 13	Q 14	Q 15			Q 16			R	S						
	INSPECTION	DESIGN SITE GRADING PLAN REQUIRED BY F.H.A.	STAKING AND GRADING HOUSES: 1 PER ORDER	STAKING AND GRADING HOUSES: 3 OR MORE ADJACENT	STAKING AND GRADING HOUSES: 6 OR MORE ADJACENT	FOUNDATION LOCATION: 1 PER ORDER	FOUNDATION LOCATION: 3 OR MORE ADJACENT	AVERAGE PER HOUSE OR PER LOT FEE FOR ALL ENGINEERING AND SURVEYING RELATIVE TO SUBDIVISION DEVELOPMENT FOR F.H.A. APPROVAL	FEE TO SET 30" BY 8" SQUARE CONCRETE MONUMENTS AT PRE-SURVEYED POINTS.	DO YOU MAINTAIN A SUITABLE COST ACCOUNTING SYSTEM AS A GUIDE TO FEES?	SELF EMPLOYED (S) FULL TIME (F) PART TIME (P)	TOTAL EMPLOYEES (T) FIELD (F) OFFICE (O)	DO YOU OPERATE FROM YOUR HOME (H) OFFICE (O)	INDICATE WHETHER YOUR OPERATION IS RURAL (R) METROPOLITAN (M) OR BOTH (B)	ARE YOU A MEMBER OF A.C.S.M.?	
ALABAMA +		L.L.	$ 17.50	$ 12.50	L.L.	L.L.	L.L.	L.L.	$ 10.00	YES 10% NO 90%	SF 100%	F 0 T 3 4	H 80% O 20%	B 70% R 30%	YES 50% NO 50%	
ALASKA			$ 90.00			40.00			25.00	YES 90% NO 10%	SF 100%	L.L.	L.L.	L.L.	L.L.	
ARIZONA	DESIGN		50.00	25.00	12.50	L.L.	L.L.	L.L.	30.00	YES 50% NO 50%	SF 100%	F 3 O 1 T 4	H 50% O 50%	B 100%		
ARKANSAS	%	5.00	10.00	10.00	5.00	10.00	10.00	75.00 + % FOR DESIGN	AV. 15.00 M-M 10-35	NO 100%	SF 50% P 50%	F 3 O 1 T 4	H 90% O 10%	B 70% R 30%	YES 100%	
CALIFORNIA + (FEE SCHEDULE - SANTA CLARA, SAN-FRANCISCO, LOS ANGELES, MONTEREY, SACRAMENTO, SAN DIEGO)						65.00 HOURLY CHARGE PREDOMINANT	35.00 HOURLY CHARGE PREDOMINANT	175.00	20.00 HOURLY CHARGE PREDOM.	YES 60% NO 35%	SF 100%	F 5 O 3 T 8	H 35% O 65%	B 72% M 15% R 13%	YES 70% NO 30%	
COLORADO	HOURLY	15.00	20.00	15.00	10.00	15.00	12.00	60.00	L.L.	YES 50% NO 50%	SF 85% SP 15%	F 5 O 2 T 7	H 5% O 95%	B 30% M 70%	YES 14% NO 86%	
CONNECTICUT +	HOURLY	L.L.	35.00 HOURLY	30.00 CHARGE	25.00 PREDOM.	25.00	17.50	125.00	25.00	NO 100%	SF 75% P 25%	F 4 O 1 T 5	L.L.	B 25% M 50% R 25%	YES 75% NO 25%	
DELAWARE		10.00	25.00	20.00	15.00	20.00	15.00	L.L. (100.00 INDICATED)	10.00	YES 100%	SF 100%	F 10 O 5 T 15	H 10% O 90%	B 100%	YES 70% NO 30%	
FLORIDA +		L.L.	AV. $35.00 M-M. 10-35	AV. $25.00 M-M. 10-25	AV. $20.00 M-M. 10-20	20.00	15.00	80.00	10.00	YES 40% NO 60%	SF 80% SP 20%	F 10 O 4 T 14	H 50% O 50%	B 70% M 30%	YES 100%	
GEORGIA * + (SEE GEORGIA ASSOC. LAND SURVEYORS FE		L.L.	25.00	22.50	16.00	20.00	17.50		100.00 †		SF 100%	F 6 O 2 T 8	H 8% O 92%	B 100%	YES 25% NO 75%	
IDAHO	LARGE							L.L.	L.L.	NO 100%	SF 70% P 30%	F 3 O 1 T 4	H 20% O 80%	B 80% R 20%	YES 65% NO 35%	
ILLINOIS + (SEE "SOCIETY PROF. LAND SURVEYORS" FEE SCHEDULE)		$ 10.00	30.00	15.00	15.00	15.00	12.50	140.00 PER LOT	L.L.	YES 70% NO 30%	SF 100%	F 6 O 3 T 9	H 10% O 90%	B 75% M 15% R 10%	YES 70% NO 30%	
INDIANA * (SEE IND. SOCIETY PROF. LAND SURVEYORS FEE SCHEDULE)	%	HOURLY	HOURLY			HOURLY		$ 95.00 SURVEYING ONLY	15.00	YES 72% NO 28%	SF 75% P 25%	F 4 O 1 T 5	H 90% O 10%	B 50% R 50%	YES 62% NO 38%	
IOWA * (SEE IOWA ENGINEERING SOCIETY FEE SCHEDULE)	%	HOURLY	AV. $35.00 M-M. 20-75	AV. $0.00 M-M. 15-35	15.00	25.00	L.L.	100.00	15.00	YES 80% NO 20%	SF 100%	F 8 O 2 T 8	H 50% O 50%	B 50% M 50%	YES 80% NO 80%	
KANSAS	7.50	10.00	AV. 20.00 M.M. 10-35	12.50	15.00	20.00	15.00	100.00	25.00	YES 90% NO 10%	SF 100%	F 10 O 4 T 14	H 80% O 60%	B 90% R 10%	YES 10% NO 30%	
KENTUCKY	INCLUDED	10.00	25.00	20.00	15.00	25.00	20.00	110.00	L.L.	L.L.	SF 100%	F 7 O 3 T 10	O 100%	B 50% M 50%	YES 50% NO 50%	
LOUISIANA (ANSWERS REPRESENT METROPOLITAN AREAS ONLY)						L.L.		L.L.	10.00	NO 100%	SF 100%	F 10 O 4 T 14	O 100%	B 50% M 50%	YES 50% NO 50%	
MAINE						L.L.		L.L.	10.00	YES 10%	SF 50%	F 3 O 1	H 90%	B 15%	L.L.	

	ATTEMPTS BEING MADE	3.50 HR.	2.50 HR.	2.25 HR.	2.00 HR.	1.50 HR.	1.25 HR.	1.25 HR.	2.00 HR.	1.25 HR.	1.25 HR.	1.00

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KENTUCKY	2.500	ATTEMPTS BEING MADE AT LOCAL ORGANIZATION OF SURVEYORS	$ 3.50 HR.	2.50 HR.	2.25 HR.	2.00 HR.	1.50 HR.	1.25 HR.	1.25 HR.	2.00 HR.	1.85 HR.	1.85 HR.	1.00 HR.
LOUISIANA (ANSWERS REPRESENT METROPOLITAN AREAS ONLY)	2.857		L. L.	3.00 HR.	2.50 HR.	1.75 HR.	1.50 HR.	1.25 HR.	1.25 HR.		2.00 HR.	2.00 HR.	1.00 HR.
MAINE	1.500	NON-VOLUME PART-TIME OPERATIONS NOTED	L. L.	$ 3.50 HR.	3.00 HR.		1.50 HR.	1.50 HR.	1.50 HR.				1.00 HR.
MARYLAND +	2.773	DESIRE TO RAISE STANDARD OF RURAL FEES	L.L.	2.75 HR	2.50 HR.	2.00 HR.	1.75 HR.	1.50 HR. RURAL 1.25 HR.	1.50 HR. RURAL 1.25 HR.	2.25 HR.	2.25 HR.	2.25 HR.	1.00 HR.
MASSACHUSETTS * (SEE CONN. VALLEY ASSOC. FEE SCHEDULE)	2.252		$ 4.50 HR.	2.25 HR.	AV. 2.25 HR. M-M. 1.83-2.50	AV. 2.10 HR. M-M. 1.50-2.50	AV. 1.90 HR. M-M. 1.60-2.00	AV. 1.80 HR. M-M. 1.40-2.00	AV. 1.60 HR. M-M. 1.15-2.00	2.25 HR.	AV. 2.00 HR M-M. 1.60-2.25	AV. 2.50 HR M-M. 2.00-3.00	1.25 HR.
MICHIGAN * (SEE MICH. ASSOC. OF CIVIL ENGINEERS & LAND SURVEYORS IN PRIVATE PRACTICE, INC., FEE SCHEDULE)	1.908		AV. $ 5.00 HR. M-M. 5.00-10.00	L.L.	AV. 2.50 HR. M-M. 2.50-3.50	AV. 2.40 HR. M-M. 2.25-3.0	AV. 2.25 HR. M-M. 2.00-2.50	AV. 1.80 HR. M-M. 1.50-2.00	1.65 HR.	L.L.	2.35 HR.	2.50 HR.	1.65 HR.
MINNESOTA * + (SEE MINN. SOCIETY OF PROF. ENGRS., MINN. LAND SURVEYORS ASSOC. HENNEPIN COUNTY ASSOC. FEE SCHEDULE)	2.566		$ 5.00 HR.	4.00 HR.	2.50 HR.	2.25 HR.	1.70 HR.	1.80 HR.	AV. 1.80 HR. M-M. 1.25-1.80	$50.00 MONTHLY	2.40 HR.	2.00 HR.	1.25 HR.
MISSISSIPPI	1.950		$500.00 MONTH	2.25 HR.	2.10 HR.	2.00 HR.	1.80 HR.	1.40 HR.	1.10 HR.		2.00 HR.	2.50 HR.	1.00 HR.
MISSOURI * (SEE MO. ASSOC. OF LAND SURVEYORS FEE SCHEDULE)	2.803	ENCOURAGE FIXED MINIMUM FEES	$5.00 HR.	2.50 HR.	AV. 2.25 HR. M-M. 400-500 MONTH	AV. 1.75 HR. M-M. 300-375 MONTH	AV. 1.60 HR. M-M. 1.35-2.00	1.50 HR. RURAL 200 MO.	1.50 HR. RURAL 200 MO.	AV. 2.50 HR. M-M. 350-500 MONTH	AV. 2.00 HR. M-M. 350-400 MONTH	2.50 HR.	AV. 1.25 HR. M-M. 1.00-1.50
MONTANA	2.812	COMPLAINT OF PUBLIC EMPLOYEES CUTTING FEES IN SPARE TIME WORK	$ 4.00 HR.	450.00 MONTH	400.00 MONTH	AV. 1.75 HR. M-M. 1.75-3.50	AV. 1.65 HR. M-M. 1.50-2.25	1.50 HR.	1.25 HR.	450.00 MONTH	1.75 HR.	2.00 HR.	1.00 HR.
NEBRASKA	2.286		$ 700.00 MONTH	600.00 MONTH	425.00 MONTH	325.00 MONTH	1.25 HR.	1.15 HR.	1.15 HR.	600.00 MONTH	425.00 MONTH	400.00 MONTH	1.10 HR.
NEVADA	UNION 1.7774 NON-UNION 2.459		$ 6.00 HR.	UNION $ 4.50 HR. NON-UNION 3.00 HR.	UNION $ 4.00 HR. NON-UNION 3.00 HR.	UNION $ 3.65 HR. NON-UNION 2.75 HR.	UNION $ 3.65 HR. NON-UNION 1.60 HR.	UNION $ 3.52 HR. NON-UNION 1.50 HR.	UNION $ 3.52 HR. NON-UNION 1.50 HR.	UNION $ 5.50 HR. NON-UNION 3.00 HR.	UNION $ 5.50 HR. NON-UNION 3.00 HR.	UNION $ 4.00 HR. NON-UNION 3.00 HR.	
NEW HAMPSHIRE	1.851		L. L.		$ 2.25 HR.	1.90 HR.	1.65 HR.	1.50 H R.			2.00 HR.	2.00 HR.	1.25 HR.
NEW JERSEY * (SEE N.J. SOCIETY OF PROF. ENGR. SURV. MANUAL	2.195	GOOD STATE ORGANIZATION AND F.S. INDICATED	L. L.	$ 2.97 HR.	2.77 HR.	AV. 2.00 HR. M-M. 1.74-2.25	AV. 1.85 HR. M-M. 1.50-2.20	1.50 HR.	1.50 HR.	3.00 HR.	2.00 HR.	2.00 HR.	1.15 HR.
NEW MEXICO	2.016	COMPLAINT AGAINST PUBLIC EMPLOYEES LOW FEES	$ 3.00 HR.	2.75 HR.	2.65 HR.	2.40 HR.	AV. 1.65 HR. M-M. 1.50-2.50	AV. 1.65 HR. M-M. 1.50-2.50	1.50 HR.	L.L.	AV. 2.00 M-M. 1.50-2.75	1.75 HR.	1.00 HR.
NEW YORK + (SEE FEE SCHEDULES: NASSAU SUFFOLK CIVIL ENGINEERS, INC. CENTRAL N.Y. SOCIETY OF LAND SURVEYORS SUR. ASSOC. OF QUEENS BOROUGH, INC.)	3.075	GOOD LOCAL FEE CO-OPERATION NOTED	L. L.	125.00 WEEK	100.00 WEEK	80.00 WEEK	85.00 WEEK	50.00 WEEK	50.00 WEEK	90.00 WEEK	85.00 WEEK	2.50 HR.	
NORTH CAROLINA	2.325		$ 5.00 HR.	2.50 HR.	2.00 HR.	1.75 HR.	1.30 HR.	1.00 HR.	1.00 HR.	2.50 HR.	2.00 HR.	1.65 HR.	1.00 HR.
NORTH DAKOTA	2.054	LOW FEES AND PART TIME OPERATION NOTED	$ 3.50 HR.		2.00 HR.	1.80 HR.	1.40 HR.	1.25 HR.	1.25 HR.	1.75 HR.	1.50 HR.		
OHIO	2.720		L. L.	$ 3.25 HR.	3.00 HR.	2.60 HR.	1.75 HR.	AV. 1.50 HR. M-M. 1.25-2.00	AV. 1.50 HR. M-M. 1.25-2.00	3.65 HR.	2.60 HR.	3.00 HR.	1.50 HR.
OKLAHOMA	2.707	OIL WELL LOCATION $50.00 MINIMUM INDICATED	L. L.	$ 300.00 MONTH	400.00 MONTH		350.00 MONTH	325.00 MONTH		600.00 MONTH	375.00 MONTH		
OREGON	2.078		$5.00 HR.	530.00 MONTH	2.75 HR.	2.50 HR.	2.00 HR.	AV. 1.75 HR. M-M. 1.50-2.50	1.65 HR.	530.00 MONTH	2.25 HR.	2.00 HR.	1.50 HR.
PENNSYLVANIA	2600	COORDINATION OF SURVEYOR PROBLEMS NEEDED	$ 4.00 HR.	2.50 HR.	2.25 HR.	2.00 HR.	1.50 HR.	1.25 HR.	1.25 HR.	3.00 HR.	2.00 HR.	2.00 HR.	1.00 HR.
RHODE ISLAND	1.714	PUBLIC EMPLOYEES PART-TIME WORK LOW-ERS FEES			$ 2.50 HR.		1.50 HR.	1.25 HR.			2.00 HR.		1.00 HR.
SOUTH CAROLINA	2.298	INTEREST IN HIGHER FEES	$ 600.00 MONTH	450.00 MONTH	$ 2.00 HR.	1.60 HR.	1.35 HR.	1.00 HR.	1.00 HR.	500.00 MONTH	1.65 HR.	1.65 HR.	1.00 HR.
SOUTH DAKOTA	1.989		$ 800.00 MONTH	550.00 MONTH	450.00 MONTH	2.50 HR.	1.75 HR.	1.60 HR.	1.60 HR.	450.00 MONTH	1.75 HR.	1.75 HR.	1.50 HR.
TENNESSEE	2.551	INTEREST IN FEE SCHEDULE & LICENSE LAW	$ 500.00 MONTH	450.00 MONTH	2.00 HR.	1.87 HR.	1.65 HR.	AV. 1.25 HR. M. M. 1 - 1.50	1.25 HR.	90.00 WEEK	1.70 HR.	1.65 HR.	1.25 HR.

.85 HR.	1.85 HR.	1.00 HR.	NO	H 100%	NO 100%	NONE	NO 100%	INDIV. SURVEY SCHEDULE YES 50% NO 50%	D 100 %	$ 15.00	20.00	40.00	80.00	HOURLY		H 100%	M 80.00	80.00	25.00	30.00
2.00 HR.	2.00 HR.	1.00 HR.	NO	F 50% H 50%	SOME INDICATION OF INDIVIDUAL SCHEDULES (I.L.)	I.L.	I.L.	N 50 % D 50 %	AV. $40.00 M-M. 25-55	45.00	AV. 75.00 M-M. 40-150	65.00	HOURLY		H 100%	M 50.00	AV. 75.00 M-M. 60-150	AV. 80.00 M-M. 40-65	I.L.	
		1.00 HR.	NO	F 10% H 90%	NO 100 %		NO 100%	YES 50% (INDIV.) NO 50%	N 40 % D 60 %	HOURLY CHARGE PREDOMINANT						H 100%	AV. M 3.80 M-M. 350-500	50.00 HOURLY	38.00 HOURLY		
2.35 HR.	2.35 HR.	1.00 HR.	NO	F 20 % H 80 %	YES 50% NO 50%	LOCAL	YES 30% NO 70%	YES 85% NO 15 %	A 10 % N 80 % D 70 %	AV. $45.00 M-M. 25-75 RURAL 25.00		AV. 65.00 RURAL 30.00	45.00	75.00	80.00	45.00	H 90 % A 10 % $ 15.00 PER ACRE	M 80.00 M-M. 25-100 H 10.00	AV. 50.00 M-M. 25-100	AV. 25.00 M-M. 25-50 RURAL HOURLY	AV. 65.00 M-M. 35-125	
AV. 2.00 HR. M-M. 1.60-2.25	AV. 2.50 HR. M-M. 2.00-3.00	1.25 HR.	NO	F 10 % H 90 %	YES 10% NO 90%	LOCAL	YES 25% NO 75%	YES 70% NO 30%	N 15 % D 85 %	AV. $ 40.00 M-M. 25-50	AV. 65.00 M-M. 30-100	AV. 75.00 M-M. 38-100	AV. 125.00 M-M. 40-200	80.00	100.00	H 100%	AV. M 50.00 M-M. 38-75	HOURLY CHARGE PREDOMINANT			HOURLY CHARGE PREDOM.	
2.35 HR.	2.50 HR.	1.85 HR.	NO	F 50 % H 50 %	YES 70% NO 30%	STATE	YES 80% NO 50%	YES 100%	A 10% N 15% D 75%	AV. $25.00 M-M. 18-40	AV. 30.00 M-M. 20-50	AV. 25.00 M-M. 25-90	40.00	HOURLY CHARGE PREDOMINANT		H 95% A 5%	AV. M 10000 M-M. 50-100	AV. 50.00 HR. ON PR. M-M 25-125	AV. 80.00 M-M. 20-85	75.00 HRLY. CHG. PREDOM.	
2.40 HR.	2.00 HR.	1.25 HR.	NO	F 30% H 70%	YES 100%	STATE 25% LOCAL 25% $ BL 50%	YES 100%	YES 100%	N 80% D 20%	AV. $ 40.00 M-M. 35-40	AV. 45.00 M.-M. 35-60	75.00	75.00	75.00 HOURLY CHARGE PREDOMINANT		H 100%	AV. M 100.00 M-M. 75-100	85.00	AV. 30.00 M-M. 10-40	40.00		
2.00 HR.	2.50 HR.	1.00 HR.	NO	F 10% H 90%	NO 100%		NO 100%	YES 90% (INDIV.) NO 10%	D 100%	$ 20.00	30.00	20.00	50.00			H 100%	N 50.00	I.L.	I.L.	30.00		
AV. 2.00 HR. M-M. 1.60-2.00 MONTH	2.50 HR.	AV. 1.25 HR. M-M. 1.00-1.80	NO	F 50% H 50%	YES 65% NO 35%	STATE	YES 40% NO 60%	YES 90% NO 10%	N 30% D 70%	AV. $ 35.00 M-M. 25-45	40.00	AV. 40.00 M-M. 30-75	45.00	35.00 HOURLY CHARGE PREDOMINANT	50.00	H 100%	AV. M 85.00 M-M. 30-100	50.00	AV. 25.00 M-M. 1.25-0-45	AV. 45.00 M-M. 30-80		
1.75 HR.	2.00 HR.	1.00 HR.	NO	F 50 % H 50 %	YES 10% NO 90%	LOCAL INDIVIDUAL	NO 100%	YES 100% INDIVIDUAL	D 100 %	AV. $ 30.00 M-M. 25-40	30.00	45.00	M-M. 50-135	75.00	125.00	H 95 % $ 20.00 PER ACRE INDICATED	AV. M 65.00 M-M. 50-75	AV. 75.00 M-M. 50-100	AV. 35.00 M-M. 25-40	AV. 50.00 M-M. 35-100		
425.00 MONTH	400.00 MONTH	1.10 HR.	NO	F 50 % H 50 %	NO 100%		NO 100%	NO 100%	A 50% D 50 %	AV. $25.00 M.M. 18-35	35.00	AV. 25.00 M-M. 25-150	35.00	AV. 25.00 M-M. 25-75	35.00	N 90 % PER ACRE CHARGE INDICATED	60.00	40.00	25.00	35.00		
UNION $ 3.50 HR. NON-UNION 3.00 HR.	UNION $ 4.00 HR. NON-UNION 3.00 HR.		YES	F 50% H 50%	YES 75% NO 25%	LOCAL	YES 20% NO 80%	YES 100%	D 100%	UNION — HOURLY NON-UNION $ 35.00		UNION — HOURLY NON-UNION $ 50.00		UNION — HOURLY NON-UNION $ 80.00		UNION — HOURLY NON-UNION $ 75.00		H 100%	AV. M 75.00 M. M. $25-75	$100.00 HOURLY CHARGE PREDOMINANT	$ 50.00 HOURLY CHARGE PREDOMINANT	$ 75.00 HOURLY CHARGE PREDOM.	
2.00 HR.	2.00 HR.	1.25 HR.	NO	H 100%	NO 100%		NO 100%	YES 10% NO 90%	D 100%	$ 25.00	30.00	30.00	50.00	HOURLY		H 100%	M 50.00	HOURLY				
2.00 HR.	2.00 HR.	1.15 HR.	NO	F 10% H 90%	YES 100%	STATE	YES 80% NO 20%	YES 100%	D 100%	$ 45.00 PER LIN. FT. PERIMETER	65.00	100.00 $ 5.- 1.54 TO 25¢ PER LINEAR FOOT PERIMETER	150.00	HOURLY		HOURLY	M 100.00	65.00 $ 5.- 1.34 PER LINEAR FOOT PERIMETER	25.00	100.00		
AV. 2.00 M. M. 1.50-2.75	1.75 HR.	1.00 HR.	NO	F 50% H 50%	NO 100%		YES 30% (INDIV.) NO 80 %	YES 50% (INDIV.) NO 50%	D 100%	AV. $ 20.00 M. M. 15-35	AV. 25.00 M. M. 15-40	AV. 25.00 M. M. 20-40	AV. 35.00 M.M. 20-50	40.00	50.00	H 100%	M 50.00	HOURLY	AV. 20.00 M. M. 15-25	AV. 40.00 M. M. 25-50		
85.00 WEEK	2.50 HR.		NO	F 90% H 10 %	YES 100%	LOCAL	YES 50% NO 50%	YES 100%	D 100%	AV. $ 45.00 M. M. 40-55	I.L.	75.00	150.00	HRLY. CHG. PREDOM. 50.00 PER ACRE, 100.00 " "		H 50% A 50% 5 TO 10 ACRES THEREAFTER	M 75.00		AV. 45.00 M. M. 25-45	AV. 70.00 M. M. 55-90		
2.00 HR.	1.65 HR.	1.00 HR.	NO	F 25% H 75%	YES 50% (INDIV.) NO 50 %		YES 15% NO 85%	YES 100% (INDIV.)	A 15% H 15% D 70%	AV. $ 25.00 M.M. 25-35 RURAL 10.00	35.00 RURAL 17.50	AV. 60.00 M.M. 35-75	125.00	HRLY. CHG. PREDOM. 3.00 PER ACRE RURAL SURVEYORS 75¢ PER ACRE	1.00 PER ACRE	H 85 % A 15%	M 50.00	HOURLY	15.00	HOURLY		
1.50 HR.			NO	F 10% H 90%	NO 100%				D 100%	$ 15.00	20.00	20.00	25.00	15.00 HOURLY CHARGE PREDOMINANT		H 100%	I.L.	20.00	15.00	25.00		
2.60 HR.	3.00 HR.	1.50 HR.	NO	H 100%	YES 50% NO 50%	STATE (SOCIETY OF PROF. ENGR.)	YES 20% NO 80%	YES 50% NO 50%	N 50% D 50%	$ 50.00	HOURLY CHARGE PREDOM.	125.00	HOURLY CHARGE PREDOM.	50.00	HOURLY CHARGE PREDOM.	H 100%	100.00	150.00 HOURLY PREDOMINANT	75.00 CHARGE	HOURLY		
375.00 MONTH			NO	F 50% H 50%	NO 100%		NO 100%	YES 90% (INDIV.) NO 10%	A 50% D 70 %	$ 20.00	25.00	25.00	30.00	HOURLY		H 100%	I.L.	25.00	10.00	25.00		
2.25 HR.	2.00 HR.	1.50 HR.	NO	H 100%	YES 10% (INDIV.) NO 90 %		YES 30% NO 70%	YES 100% (INDIV.)	D 100%	AV. $ 30.00 M. M. 20-35	AV. 40.00 M. M. 25-50	AV. 35.00 M. M. 20-50	50.00	40.00	60.00	H 100%	M 50.00	AV. 25.00 M. M. 20-50	AV. 20.00 M. M. 1.50-35	45.00 HOURLY CHARGE PREDOM.	
2.00 HR.	2.00 HR.	1.00 HR.	NO	H 100%	YES 50% NO 50%	LOCAL	YES 10% NO 90%	YES 100%	D 100%	AV. 35.00 M. M. 30-45	50.00	HOURLY	CHARGE	35.00 OR 6.00 PER ACRE PREDOMINANT		N 90% A 10%	M 75.00	50.00 INDICATED HOURLY CHARGE PREDOMINANT				
2.00 HR.		1.00 HR.	NO	F 40% H 60%	NO 100%		YES 50% NO 50%	YES 50% NO 50%	D 100%	$ 20.00	30.00	40.00	50.00	HOURLY	HOURLY	H 100%	I.L.	35.00	AV. 25.00 M. M. 20-30	45.00		
1.65 HR.	1.65 HR.	1.00 HR.	NO	F 10% H 90%	NO 100%		NO 100%	YES 10% (INDIV.) NO 90%	D 100%	$ 20.00	25.00	40.00	50.00	HOURLY		HOURLY CHARGE INDICATED	M 50.00	HOURLY CHARGE PREDOMINANT				
1.75 HR.	1.75 HR.	1.50 HR.	NO	F 30% H 70%	YES 10% NO 90%	LOCAL	YES 50% (INDIV.) NO 50%	YES 50% NO 50%	N 30% D 70 %	AV. $ 15.00 M. M. 15-25	AV. 25.00 M. M. 15-25	25.00	30.00	35.00	AV. 80.00 M.M. 30-200	H 100 %	AV. M 50.00 M. M. 30-75	20.00	10.00	HOURLY		
1.70 HR.	1.65 HR.	1.25 HR.		F 10% H 90%	NO 100%		NO 100%	NO 100%	D 100%	$ 20.00	AV. 25.00 M. M. 20-30	30.00	50.00	HOURLY		HRLY. CHG. PREDOM. (PER ACRE CHARGE INDICATED	M 50.00	40.00	20.00	35.00		
										AV.	AV.						AV.	AV.	AV.			

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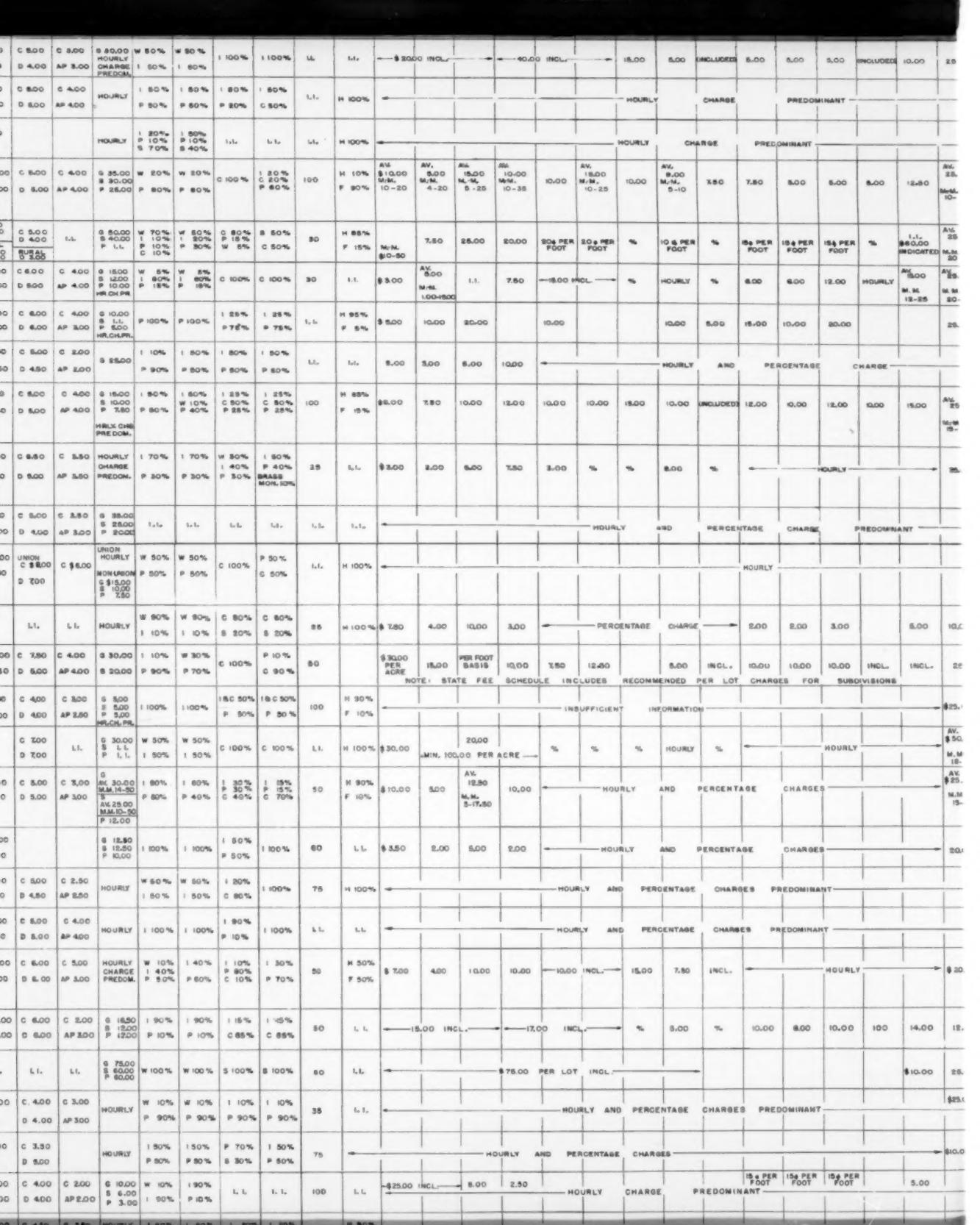

8.00	5.00	5.00	INCLUDED	15.00	25.00	20.00	15.00	25.00	20.00	110.00	L.L.	L.L.	SF 100%	O 3 T 10	O 100%	M 50%	NO 50%	KENTUC
PREDOMINANT →										L.L.	10.00	NO 100%	SF 100%	F 10 O 4 T 14	O 100%	B 50% M 50%	YES 50% NO 50%	LOUISIA REPRESENT ME
PREDOMINANT →										L.L.	10.00	YES 10% NO 90%	SF 50% P 50%	F 3 O 1 T 4	H 90% O 10%	B 15% R 85%	L.L.	MAINE
7.50	5.00	5.00	5.00	12.50	AV. 25.00 M-M. 10-40	20.00	15.00	30.00	25.00	110.00	AV. 15.00 M-M. 10-30	YES 50% NO 50%	SF 80% P 20% RURAL SF 80% P 80%	F 12 O 5 T 17	H 40% O 60%	B 80% M 20% R 20%	YES 70% NO 30%	MARYLA
15¢ PER FOOT	10¢ PER FOOT	15¢ PER FOOT	%	L.L. $60.00 INDICATED	AV. 25.00 M.M. 20-35	20.00	17.00	AV. 20.00 M.M. 14-25	AV. 18.00 M.M. 12-20	AV. 200.00 M.M. 150-250	AV. 50.00 M-M. 15-35	YES 75% NO 25%	SF 75% P 25%	F 10 O 4 T 14	H 75% O 25%	B 50% M 25% R 25%	YES 90% NO 10%	MASSAC CONN. VALLEY
6.00	6.00	12.00	HOURLY	AV. 15.00 M.M. 12-25	AV. 25.00 M.M. 20-30	AV. 18.00 M.M. 12.50-25	L.L.	20.00	17.00	MICH. ASSOC 6000 PER ACRE MIN. + LOT STAKE AND TOPO	7.50	YES 90% NO 10%	SF 60% P 40%	F 10 O 5 T 15	H 15% O 85%	B 50% M 25% R 25%	YES 30% NO 70%	MICHIGA IN PRIVATE PRACT
15.00	10.00	20.00			25.00	15.00	12.00	15.00	12.00	L.L. 200.00 INDICATED	AV. 15.00 M.M. 10-25	YES 30% NO 70%	SF 80% P 20%	F 10 O 5 T 15	B 100%	L.L.	YES 75% NO 25%	MINNES ORD ASSOC. NE FEE SCHEDULE
PERCENTAGE CHARGE →										L.L.	L.L.	YES 100%	SF 100%	F 9 O 2 T 11	O 100%	B 100%	YES 90% NO 10%	MISSISS
12.00	10.00	12.00	10.00	15.00	AV. 28.00 M-M. 15-50	17.50	15.00	AV. 25.00 M-M. 15-45	20.00	135.00	15.00	YES 100%	SF 80% P 20%	F 8 O 4 T 12	H 40% O 60%	B 85% R 15%	YES 50% NO 50%	MISSOU OF LAND SURV
← HOURLY →					35.00	20.00	17.50	30.00	12.50	L.L.	35.00	YES 50% NO 50%	SF 100%	F 3 O 2 T 5	H 50% O 50%	B 100%	YES 100%	MONTAN
NTAGE CHARGE PREDOMINANT →										L.L.	L.L.	YES 50% NO 50%	SF 100%	L.L.	H 50% O 50%	M 100%	NO 100%	NEBRAS
HOURLY →										NON-UNION $60.00	L.L.	YES 50% NO 50%	SF 80% P 20%	F 6 O 2 T 8	H 20% O 80%	B 80% R 20%	YES 30% NO 70%	NEVADA
2.00	2.00	3.00		5.00	10.00	5.00	3.00	5.00	3.00	L.L.	10.00	YES 100%	SF 100%	F 3 O 1 T 4	H 100%	B 100%	YES 10% NO 90%	NEW HA
10.00 CHARGES FOR SUBDIVISIONS	10.00	10.00	INCL.	INCL.	25.00	22.50	20.00	25.00	25.00	125.00	25.00	YES 100%	SF 100%	F 6 O 1 T 7	O 100%	B 80% R 20%	YES 100%	NEW J SOCIETY OF
→					$25.00	10.00	10.00	15.00	10.00	AV. 125.00 PLUS % M.M. 65-150	10.00	YES 70% NO 30%	SF 80% P 20%	F 4 O 2 T 6	H 50% O 50%	B 80% R 20%	NO 100%	NEW M
HOURLY →					AV. $ 50.00 M.M. 18-100	M.M. 10-75	M.M. 15-60	15.00		L.L.	15.00	YES 50% NO 50%	SF 100%	F 6 O 3 T 9	H 50% O 50%	B 100%	YES 100%	NEW YO NASSAU SUFFO CENTRAL N.Y. B SUR. ASSOC OF
TAGE CHARGES →					AV. $ 25.00 M.M. 19-25	30.00	12.50	15.00	10.00	65.00 PLUS CONSTRUCT LAYOUT AND DESIGN	7.50	YES 85% NO 15%	SF 80% P 20%	F 6 O 3 T 9	H 40% O 60%	B 85% R 15%	YES 40% NO 60%	NORTH
AGE CHARGES →					20.00	15.00	10.00	10.00	7.50	L.L.		NO 100%	SF 50% P 50%	F 3 O 1 T 4	H 100%	B 10% R 90%	YES 50% NO 50%	NORTH
GES PREDOMINANT →										L.L.	20.00	L.L.	SF 100%	L.L.	O 100%	B 100%	L.L.	OHIO
GES PREDOMINANT →												YES 10% NO 90%	SF 100%	F 5 O 3 T 8	O 100%	B 50% M 50%	NO 100%	OKLAH
HOURLY →					$ 20.00	15.00	15.00	20.00	15.00	125.00	AV. 30.00 M.M. 15-40	YES 75% NO 25%	SF 70% P 30%	F 6 O 3 T 9	H 40% O 60%	B 70% R 30%	YES 70% NO 30%	OREGO
10.00	8.00	10.00	100	14.00	12.00	10.00	10.00			110.00	12.50	YES 50% NO 50%	SF 100%	F 6 O 3 T 9	O 100%	B 70% R 30%	L.L.	PENNS
				$ 10.00	25.00	18.00	12.50	25.00	18.00	100.00	10.00	YES 50% NO 50%	SF 50% P 50%	F 3 O 2 T 5	H 50% O 50%	B 70% R 30%	NO 100%	RHODE
ES PREDOMINANT →					$25.00	20.00	20.00	25.00	20.00	L.L.	10.00	YES 25% NO 75%	SF 90% P 10%	F 3 O 1 T 4	H 10% O 90%	B 100%	L.L.	SOUTH
→					$10.00	3.00		7.00	5.00	L.L.		YES 50% NO 50%	P 100%	F 8 O 3 T 11	H 100%	B 100%	NO 100%	SOUTH
15¢ PER FOOT	10¢ PER FOOT	15¢ PER FOOT		5.00														
INANT →										45.00	10.00	YES 10% NO 90%	SF 50% P 50%	F 5 O 2 T 7	H 60% O 40%	B 60% R 40%	NO 100%	TENNE
CHARGES →										125.00	AV. 15.00	YES 50%	SF 100%	F 6 O 2	O 100%	B 90%	YES 70%	NOTE: STATE SECTIONS F

	MONTANA			CUTTING FEES IN				M-M. 1.75-2.50	M-M. 180-225									

NO 80%	KENTUCKY
YES 50% NO 50%	LOUISIANA (ANSWERS REPRESENT METROPOLITAN AREAS ONLY)
L.I.	MAINE
YES 70% NO 30%	MARYLAND +
YES 90% NO 10%	MASSACHUSETTS * (SEE CONN. VALLEY ASSOC. FEE SCHEDULE)
YES 30% NO 70%	MICHIGAN * (SEE MICH. ASSOC. OF CIVIL ENGINEERS & LAND SURVEYORS IN PRIVATE PRACTICE, INC. FEE SCHEDULE)
YES 75% NO 25%	MINNESOTA *+ (SEE MINN. SOCIETY OF PROF. ENGRS., MINN. LAND SURVEY ORS ASSOC. HENNEPIN COUNTY ASSOC. FEE SCHEDULE)
YES 90% NO 10%	MISSISSIPPI
YES 80% NO 80%	MISSOURI * (SEE MO. ASSOC. OF LAND SURVEYORS FEE SCHEDULE)
YES 100%	MONTANA
NO 100%	NEBRASKA
YES 30% NO 70%	NEVADA
YES 10% NO 90%	NEW HAMPSHIRE
YES 100%	NEW JERSEY * (SEE N.J. SOCIETY OF PROF. ENGR. SURV. MANUAL)
NO 100%	NEW MEXICO
YES 100%	NEW YORK + (SEE FEE SCHEDULES: NASSAU SUFFOLK CIVIL ENGINEERS, INC. CENTRAL N.Y. SOCIETY OF LAND SURVEYORS SUR. ASSOC. OF QUEENS BOROUGH, INC.)
YES 40% NO 60%	NORTH CAROLINA
YES 50% NO 50%	NORTH DAKOTA
L.I.	OHIO
NO 100%	OKLAHOMA
YES 70% NO 30%	OREGON
L.I.	PENNSYLVANIA
NO 100%	RHODE ISLAND
L.I.	SOUTH CAROLINA
NO 100%	SOUTH DAKOTA
NO 100%	TENNESSEE
YES 70%	NOTE: STATE DIVIDED INTO FIVE SECTIONS FOR CERTAIN QUESTIONS

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MONTANA	2.212	CUTTING FEES IN SPARE TIME WORK				M-M. 1.75-3.50	M-M. 1.50-2.25						
NEBRASKA	2.286		$700.00 MONTH	600.00 MONTH	425.00 MONTH	325.00 MONTH	1.25 HR.	1.15 HR.	1.15 HR.	800.00 MONTH	425.00 MONTH	400.00 MONTH	1.10 HR.
NEVADA	UNION 1.7774 NON-UNION 2.459		$ 6.00 HR.	UNION $4.50 HR. NON-UNION 3.00 HR.	UNION $4.00 HR. NON-UNION 3.00 HR.	UNION $3.85 HR. NON-UNION 2.75 HR.	UNION $3.85 HR. NON-UNION 1.60 HR.	UNION $3.52 HR. NON-UNION 1.50 HR.	UNION $3.52 HR. NON-UNION 1.50 HR.	UNION $5.50 HR. NON-UNION 3.00 HR.	UNION $5.50 HR. NON-UNION 3.00 HR.	UNION $4.00 HR. NON-UNION 3.00 HR.	
NEW HAMPSHIRE	1.651		" "		$ 2.25 HR.	1.90 HR.	1.65 HR.	1.50 HR.			2.00 HR.	2.00 HR.	1.25 HR.
NEW JERSEY* (SEE N.J. SOCIETY OF PROF. ENGR. SURV. MANUAL)	2.195	GOOD STATE ORGANIZATION AND F.S. INDICATED	" "	$2.87 HR.	2.77 HR.	AV. 2.00 HR. M-M. 1.75-2.25	AV. 1.85 HR. M-M. 1.60-2.20	1.50 HR.	1.50 HR.	3.00 HR.	2.00 HR.	2.00 HR.	1.15 HR.
NEW MEXICO	2.016	COMPLAINT AGAINST PUBLIC EMPLOYEES LOW FEES	$3.00 HR.	2.75 HR.	2.65 HR.	2.40 HR.	AV. 1.65 HR. M-M. 1.50-2.50	AV. 1.65 HR. M-M. 1.50-2.50	1.50 HR.	1.1.	AV. 2.00 M-M. 1.50-2.75	1.75 HR.	1.00 HR.
NEW YORK + (SEE FEE SCHEDULES: NASSAU SUFFOLK CIVIL ENGINEERS, INC. CENTRAL N.Y. SOCIETY OF LAND SURVEYORS SUR. ASSOC. OF QUEENS BOROUGH, INC.)	3.075	GOOD LOCAL FEE CO-OPERATION NOTED	" "	125.00 WEEK	100.00 WEEK	80.00 WEEK	65.00 WEEK	50.00 WEEK	50.00 WEEK	90.00 WEEK	85.00 WEEK	2.50 HR.	
NORTH CAROLINA	2.325		$5.00 HR.	2.50 HR.	2.00 HR.	1.75 HR.	1.30 HR.	1.00 HR.	1.00 HR.	2.50 HR.	2.00 HR.	1.65 HR.	1.00 HR.
NORTH DAKOTA	2.054	LOW FEES AND PART TIME OPERATION NOTED	$3.50 HR.		2.00 HR.	1.80 HR.	1.40 HR.	1.25 HR.	1.25 HR.	1.75 HR.	1.50 HR.		
OHIO	2.720		" "	$3.25 HR.	3.00 HR.	2.80 HR.	1.75 HR.	AV. 1.50 HR. M-M. 1.25-2.00	AV. 1.50 HR. M-M. 1.25-2.00	3.65 HR.	2.50 HR.	3.00 HR.	1.50 HR.
OKLAHOMA	2.707	OIL WELL LOCATION $60.00 MINIMUM INDICATED	" "	$600.00 MONTH	400.00 MONTH		350.00 MONTH	325.00 MONTH		600.00 MONTH	375.00 MONTH		
OREGON	2.076		$5.00 HR.	530.00 MONTH	2.75 HR.	2.50 HR.	2.00 HR.	AV. 1.75 HR. M-M. 1.50-2.50	1.65 HR.	530.00 MONTH	2.25 HR.	2.00 HR.	1.90 HR.
PENNSYLVANIA	2500	COORDINATION OF SURVEYOR PROBLEMS NEEDED	$ 4.00 HR.	2.50 HR.	2.25 HR.	2.00 HR.	1.50 HR.	1.25 HR.	1.25 HR.	3.00 HR.	2.00 HR.	2.00 HR.	1.00 HR.
RHODE ISLAND	1.714	PUBLIC EMPLOYEES PART TIME WORK LOWERS FEES			$2.50 HR.		1.50 HR.	1.25 HR.			2.00 HR.		1.00 HR.
SOUTH CAROLINA	2.298	INTEREST IN HIGHER FEES	$600.00 MONTH	450.00 MONTH	$ 2.00 HR.	1.80 HR.	1.35 HR.	1.00 HR.	1.00 HR.	500.00 MONTH	1.65 HR.	1.65 HR.	1.00 HR.
SOUTH DAKOTA	1.989		$600.00 MONTH	550.00 MONTH	450.00 MONTH	2.50 HR.	1.75 HR.	1.60 HR.	1.60 HR.	450.00 MONTH	1.75 HR.	1.75 HR.	1.50 HR.
TENNESSEE	2.551	INTEREST IN FEE SCHEDULE & LICENSE LAW	$500.00 MONTH	450.00 MONTH	2.00 HR.	1.87 HR.	1.65 HR.	AV. 1.25 HR. M-M. 1-1.50	1.25 HR.	90.00 WEEK	1.70 HR.	1.65 HR.	1.25 HR.
NOTE: STATE DIVIDED INTO FIVE SECTIONS FOR CERTAIN QUESTIONS. TEXAS * (SEE TEXAS SURVEYORS ASSOC. FEE SCHEDULE)	2.293	SUGGEST TYING FEE TO VALUE OF PROPERTY	$3.00 HR.	$25.00 MONTH	2.25 HR.	1.80 HR.	1.70 HR.	1.50 HR.	1.50 HR.	2.50 HR.	2.00 HR.	2.75 HR.	1.00 HR.
UTAH * (SEE STATE & INTER-MOUNTAIN INSTITUTE OF CONSULTING ENGINEERS OF SALT LAKE CITY FEE SCHEDULES)	1.777		$4.50 HR.	550.00 MONTH	AV. 3.00 HR. M-M. 400-650 MONTH	AV. 2.65 HR. M-M. 2.00-3.00	2.00 HR.	1.75 HR.	1.75 HR.	2.50 HR.	2.40 HR.	2.50 HR.	AV. 1.50 HR. M-M. 200-275 MONTH
VERMONT	4.904	DESIRE FOR STATE LICENSE LAW INDICATED	" "	$115.00 WEEK	100.00 WEEK	1.65 HR	1.50 HR.	1.25 HR.	1.25 HR.	1.90 HR	1.90 HR.	1.90 HR.	1.00 HR.
VIRGINIA (STATE FEE SCHEDULE PROPOSED)	2.459	LOCAL FEE SCHEDULE NEED		$125.00 WEEK	110.00 WEEK	90.00 WEEK	75.00 WEEK	60.00 WEEK	60.00 WEEK	2.00 HR.	2.00 HR.		1.00 HR.
F.S. RECENTLY ADOPTED WASHINGTON * (SEE LAND SURVEYORS ASSOC. OF WASH. FEE SCHEDULE)	1.466 NEW F&E SCHEDULE WILL RAISE RATIO		$ 9.00 HR.		3.00 HR.	2.75 HR.	2.50 HR.	2.00 HR.	2.00 HR.		2.50 HR		
WEST VIRGINIA	1.819	COMPLAINS PUBLIC EMPLOYEE CUTTING FEES IN SPARE TIME WORK		$2.50 HR	2.25 HR.		1.75 HR.	1.50 HR.	1.50 HR.	2.75 HR.	2.00 HR.		
WISCONSIN	2.857	INCREASE IN FEES INDICATED	$800.00 MONTH	2.75 HR.	2.50 HR.	2.10 HR.	1.85 HR.	1.80 HR.	1.80 HR.	2.80 HR.	2.40 HR.	2.75 HR.	1.40 HR.
WYOMING * (SEE WYOM. ASSOC. OF PRACTICING ENGR. & SURVEYORS FEE SCHEDULE)	1.944	$ 25.00 MINIMUM INDICATED FOR MINER AL CLAIM SURVEY	$ 4.00 HR.	2.75 HR.	2.75 HR.	2.00 HR.	1.65 HR.	1.50 HR.	1.50 HR.	1.65 HR.	2.50 HR.	2.50 HR.	1.25 HR.
			1	2	3	4	5	6	7	8	9	10	11

9	10	11		A	B	C	D	E	F	G		H		I		J	K	L
			NO	H 50%	NO 90%	INDIVIDUAL	NO 100%	YES 100% INDIVIDUAL	D 100%	M.M. 25-40			M.M. 50-135			$20.00 PER ACRE INDICATED	M.M. 80-75	M.M. 50-100
25.00 MONTH	400.00 MONTH	1.10 HR.	NO	F 50% H 50%	NO 100%		NO 100%	NO 100%	A 50% D 50%	AV. $25.00 M.M. 18-35	35.00	AV. 25.00 M.M. 25-150	35.00	AV. 25.00 M.M. 25-75	35.00	H 90% PER ACRE CHARGE INDICATED	90.00	40.00
NION 1.50 HR. ON-UNION 4.00 HR.	UNION $4.00 HR. NON-UNION 3.00 HR.		YES	F 50% H 50%	YES 75% NO 25%	LOCAL	YES 20% NO 80%	YES 100%	D 100%	UNION — HOURLY NON-UNION $35.00	NON-UNION $ 50.00	UNION — HOURLY NON-UNION $ 50.00	NON-UNION $ 75.00	UNION — HOURLY NON-UNION $ 35.00	NON-UNION $ 50.00	H 100%	AV. M 75.00 M. M. $25-75	$100.00 HOURLY PREDO
2.00 HR.	2.00 HR.	1.25 HR.	NO	H 100%	NO 100%		NO 100%	YES 10% NO 90%	D 100%	$25.00	30.00	30.00	50.00	HOURLY		H 100%	M 50.00	← HO
2.00 HR.	2.00 HR.	1.15 HR.	NO	F 10% H 90%	YES 100%	STATE	YES 80% NO 20%	YES 100%	D 100%	$45.00 ES.= 13¢ PER LIN.FT. PERIMETER	65.00	100.00 ES.= 15¢ TO 25¢ PER LINEAR FOOT PERIMETER	150.00	HOURLY		HOURLY	M 100.00	65.00 ES.= 13¢ LINEAR PERIME
AV. 2.00 M. M. 50-2.75	1.75 HR.	1.00 HR.	NO	F 50% H 50%	NO 100%		YES 50% (INDIV.) NO 50%	YES 50% (INDIV.) NO 50%	D 100%	AV. $ 20.00 M. M. 15-35	AV. 25.00 M. M. 15-40	AV. 25.00 M. M. 20-40	AV. 35.00 M.M. 20-60	40.00	50.00	H 100%	M 50.00	HOURLY
15.00 WEEK	2.50 HR.		NO	F 90% H 10%	YES 100%	LOCAL	YES 50% NO 50%	YES 100%	D 100%	$45.00 M. M. 40-55	L.I.	75.00	150.00	HRLY. CHG. PREDOM. 50.00 PER ACRE, 5-10 ACRES 100.00 " THEREAFTER		H 50% A 50 %	M 75.00	
2.00 HR.	1.65 HR.	1.00 HR.	NO	F 25% H 75%	YES 50% (INDIV.) NO 50%		YES 15% NO 85%	YES 100% (INDIV.)	A 15% N 15% D 70%	AV. $ 25.00 M.M. 25-35 RURAL 10.00	35.00 RURAL 17.50	AV. 60.00 M.M. 35-75	125.00	HRLY.CHG. PREDOM. 3.00 PER ACRE RURAL SURVEYORS 75¢ PER ACRE | 1.00 PER ACRE		H 85 % A 15%	M 50.00	HOURLY
50 HR.			NO	F 10% H 90%	NO 100%				D 100%	$15.00	20.00	20.00	25.00	15.00 HOURLY PREDOMINANT	CHARGE	H 100%	L.I.	20.00
60 HR.	3.00 HR.	1.50 HR.	NO	H 100%	YES 50% NO 50%	STATE (SOCIETY OF PROF. ENGR.)	YES 20% NO 80%	YES 50% NO 50%	N 50% D 50%	$50.00	HOURLY CHARGE PREDOM.	125.00	HOURLY CHARGE PREDOM.	50.00	HOURLY CHARGE PREDOM.	H 100%	100.00	150.00 HOURLY PREDOM
175.00 MONTH			NO	F 50% H 50%	NO 100%		NO 100%	YES 90% (INDIV.) NO 10%	A 50% D 70 %	$20.00	25.00	25.00	30.00	HOURLY		H 100%	L.I.	25.00
2.25 HR.	2.00 HR.	1.50 HR.	NO	H 100%	YES 10% (INDIV.) NO 90%		YES 30% NO 70%	YES 100% (INDIV.)	D 100%	AV. $ 30.00 M.M. 20-35	AV. 40.00 M. M. 25-50	AV. 35.00 M.M. 20-50	50.00	40.00	60.00	H 100%	M 50.00	AV. 25.00 M.M. 20-30
2.00 HR.	2.00 HR.	1.00 HR.	NO	H 100%	YES 50% NO 50%	LOCAL	YES 10% NO 90%	YES 100%	D 100%	AV. 35.00 M. M. 30-45	50.00	HOURLY CHARGE PREDOMINANT		35.00 OR 6.00 PER ACRE		H 90% A 10%	M 75.00	HOURLY PRED
2.00 HR.		1.00 HR.	NO	F 40% H 60%	NO 100%		YES 50% NO 50%	YES 50% NO 50%	D 100%	$20.00	30.00	40.00	50.00	HOURLY	HOURLY	H 100%	L.I.	35.00
1.65 HR.	1.65 HR.	1.00 HR.	NO	F 10% H 90%	NO 100%		NO 100%	YES 10% (INDIV.) NO 90%	D 100%	$20.00	25.00	40.00	50.00	HOURLY		HOURLY CHARGE INDICATED	M 50.00	HOUR PRE
1.75 HR.	1.75 HR.	1.50 HR.	NO	F 30% H 70%	YES 10% NO 90%	LOCAL	YES 50% (INDIV.) NO 50%	YES 50% NO 50%	N 30% D 70 %	AV. $15.00 M. M. 15-25	AV. 25.00 M. M. 15-25	25.00	30.00	35.00	AV. 50.00 M. M. 50-200	H 100 %	AV. M 50.00 M. M. 50-75	20.00
1.70 HR.	1.65 HR.	1.25 HR.		F 10% H 90%	NO 100%		NO 100%	NO 100%	D 100%	$20.00	AV. 25.00 M. M. 20-30	30.00	50.00	HOURLY		HRLY. CHG. PREDOM. (PER ACRE CHARGE INDICATED	M 50.00	40.00
2.00 HR.	2.75 HR.	1.00 HR.	NO	H 100%	YES 20% NO 80%	LOCAL 20%	YES 30% NO 70 %	YES 50% NO 50%	A 15% N 25% D 60%	AV. $ 25.00 M. M. 15-50	AV. 40.00 M. M. 25-75	50.00	75.00	65.00	100.00	H 100%	AV. M 75.00 M. M. 50-100	AV. 40.00 M. M. 25-50
2.40 HR.	2.50 HR.	AV. 1.50 HR. M.M. 200-275 MONTH	NO	F 50% H 50%	YES 30% NO 70%	LOCAL 50% STATE 50%	YES 25% NO 75%	YES 60% NO 40%	N 10% D 90%	AV. $ 25.00 M.M. 15-35 RURAL 10.00	30.00 RURAL 15.00	AV. 40.00 M.M. 25-75	65.00	AV. 35.00 M. M. 20-75	50.00	H 100%	M 50.00 H 15.00	AV. 40.00 M.M. 30-60
1.90 HR.	1.90 HR.	1.00 HR.	NO	F 20% H 80%	NO 100%		NO 100%	YES 10% (INDIV.) NO 90%	N 60% D 40%	←	$25.00	HOURLY CHARGE PREDOMINANT				H 100%	M 50.00	HOURLY PRED
2.00 HR.		1.00 HR.	NO	F 90% H 10%	NO 100%		YES 50% (INDIV.) NO 50%	YES 50% NO 50%	D 100 %	AV. $ 35.00 M. M. 20-35	40.00	35.00 1% OF ASSESSED VALUE EVIDENT	50.00	AV. 35.00 M. M. 25-35	35.00	H 70% $100.00 1 ST ACRE 10.00 EACH ADDL ACRE	M 50.00 H 7.50	AV. 35.00 M. M. 35-50
2.50 HR			NO	H 100%	YES 30% NO 70%	LOCAL 50% STATE 50%	NO 100%	YES 70% NO 30%	N 70% D 30%	$25.00 F.S. 85.00	25.00	25.00 F.S. 125.00	40.00	35.00	65.00	H 100%	M 75.00 H 15.00	HOURLY CHARGE PREDOM.
2.00 HR.			NO	H 100%	NO 100%		NO 100%	YES 50% (INDIV.) NO 50%	N 100%	HOURLY	$ 35.00	←		HOURLY	→	H 100%	M 100.00	HOUR
2.40 HR.	2.75 HR.	1.40 HR.	NO	F 50% H 50%	YES 20% NO 80%	LOCAL	YES 10% NO 90%	YES 50% NO 50%	N 20% D 80%	AV. $30.00 M. M. 25-30	35.00	AV. 50.00 M. M. 40-100	65.00	40.00	75.00	H 100%	M 50.00 H 10.00	35.00
2.50 HR.	2.50 HR.	1.25 HR.	NO	F 5% H 95%	YES 100%	STATE	YES 100%	YES 100%	N 50% D 50%	AV. $ 20.00 M. M. 15-25	AV. 25.00 M. M. 25-35	AV. 30.00 M. M. 25-35	AV. 40.00 M. M. 35-50	25.00	60.00	H 100 %	L.I.	40.00

35.00	25.00 M.M. 25-150	35.00	25.00 M.M. 25-75	35.00	H 90% PER ACRE CHARGE INDICATED	60.00	40.00	25.00	35.00	7.50	AV. 11.00 M.M. 10-12	14.00	P $ 6.50 A 5.00	C 5.00 D 4.00	C 3.50 AP 3.00	G 35.00 S 28.00 P 20.00	L.L.	L.L.	L.L.
HOURLY NON-UNION $ 50.00	UNION NON-UNION $ 50.00	HOURLY NON-UNION $ 75.00	UNION NON-UNION $ 35.00	HOURLY NON-UNION $ 50.00	H 100%	AV. M 75.00 M. M. $25-75	$100.00 HOURLY PREDOMINANT	$ 50.00 CHARGE	$75.00 HOURLY CHARGE PREDOM.	NON-UNION $12.00 RURAL 7.00	UNION $ 20.00 NON-UNION 15.00 RURAL 9.75	UNION $ 26.00 NON-UNION 18.00 RURAL 12.50	P $ 10.00 A 9.00	UNION C $ 8.00 D 7.00	C $ 6.00	UNION HOURLY NON-UNION G $15.00 S 10.00 P 7.50	W 50% P 50%	W 50% P 50%	C 100%
30.00	30.00	50.00	HOURLY		H 100%	M 50.00	HOURLY			8.00	10.00	12.50	L.L.	L.L.	L.L.	HOURLY	W 90% I 10%	W 90% I 10%	C 80% S 20%
65.00	100.00 ES= 15¢ TO 25¢ PER LINEAR FOOT PERIMETER	150.00	HOURLY		HOURLY	M 100.00	65.00 ES= 13¢ PER LINEAR FOOT PERIMETER	25.00	100.00	7.50	AV. 13.00 M. M. 12.50-15	18.00	P 10.00 A 7.50	C 7.50 D 6.00	C 4.00 AP 4.00	G 30.00 S 20.00	I 10% P 90%	W 30% P 70%	C 100%
AV. 25.00 M. M. 15-40	AV. 25.00 M. M. 20-40	AV. 35.00 M.M. 20-60	40.00	50.00	H 100%	M 50.00	HOURLY	AV. 20.00 M.M. 15-25	AV. 40.00 M.M. 25-50	AV. 8.00 M. M. 6.50-9	AV. 12.00 M. M. 10-12	15.00	P 5.00 A 5.00	C 4.00 D 4.00	C 3.00 AP 2.50	G 5.00 S 5.00 P 5.00 HR.CH. PR.	I 100%	I 100%	I&C 50% P 50%
L.L.	75.00	150.00	HRLY. CHG. PREDOM. 50.00 PER ACRE, 5-10 ACRES 100.00 " " THEREAFTER		H 50% A 50%	M 75.00		AV. 45.00 M. M. 25-45	AV. 70.00 M. M. 55-90	12.50	AV. 18.00 M.M. 16-20	24.00	L.L.	C 7.00 D 7.00	L.L.	G 30.00 S L.L. P L.L.	W 50% I 50%	W 50% I 50%	C 100%
35.00 RURAL 12.50	AV. 60.00 M. M. 35-75	125.00	HRLY.CHG. PREDOM. 3.00 PER ACRE RURAL SURVEYORS 75¢ PER ACRE | 1.00 PER ACRE		H 85% A 15%	M 50.00	HOURLY	15.00	HOURLY	AV. 7.50 M. M. 6-10	AV. 10.00 M. M. 9-15 RURAL 6.00	AV. 12.50 M. M. 9-20	P 7.50 A 5.00	C 5.00 D 5.00	C 3.00 AP 3.00	G AV. 30.00 M.M. 14-50 S AV. 25.00 M.M. 10-30 P 12.00	I 50% P 50%	I 60% P 40%	I 30% P 30% C 40%
20.00	20.00	25.00	15.00 HOURLY CHARGE PREDOMINANT		H 100%	L.L.	20.00	15.00	25.00		7.50	9.00	P 5.00 A 4.00			G 12.50 S 12.50 P 10.00	I 100%	I 100%	I 50% P 50%
HOURLY CHARGE PREDOM.	125.00	HOURLY CHARGE PREDOM.	50.00	HOURLY CHARGE PREDOM.	H 100%	100.00	150.00 HOURLY PREDOMINANT	75.00 CHARGE	HOURLY	AV. 10.00 M. M. 8-13.75	17.00	20.00	P 8.00 A 6.00	C 5.00 D 4.50	C 2.50 AP 2.50	HOURLY	W 50% I 50%	W 80% I 50%	I 20% C 80%
25.00	25.00	30.00	HOURLY		H 100%	L.L.	25.00	10.00	25.00	12.50	15.00	17.50	P 8.00 A 6.00	C 5.00 D 5.00	C 4.00 AP 4.00	HOURLY	I 100%	I 100%	I 90% P 10%
AV. 40.00 M. M. 25-50	AV. 35.00 M. M. 20-50	50.00	40.00	60.00	H 100%	M 50.00	AV. 25.00 M. M. 20-30	AV. 20.00 M. M. 150-35	45.00 HOURLY CHARGE PREDOM.	AV. 9.00 M. M. 5-12	AV. 13.50 M. M. 10-19	AV. 18.00 M. M. 12-24	P 10.00 A 8.00	C 6.00 D 6.00	C 5.00 AP 3.00	HOURLY CHARGE PREDOM.	W 10% I 40% P 50%	I 40% P 60%	I 10% P 80% C 10%
50.00	HOURLY CHARGE		35.00 OR 6.00 PER ACRE PREDOMINANT		H 90% A 10%	M 75.00		50.00 INDICATED HOURLY CHARGE PREDOMINANT		AV. 8.50 M. M. 8-10	AV. 12.50 M. M. 12-15	AV. 15.00 M. M. 15-20	P 10.00 A 8.00	C 6.00 D 6.00	C 2.00 AP 3.00	G 16.50 S 12.00 P 12.00	I 90% P 10%	I 90% P 10%	I 15% C 85%
30.00	40.00	50.00	HOURLY	HOURLY	H 100%	L.L.	35.00	AV. 28.00 M. M. 20-30	45.00	6.00	9.00	12.00	L.L.	L.L.	L.L.	G 75.00 S 60.00 P 60.00	W 100%	W 100%	S 100%
25.00	40.00	60.00	HOURLY		HOURLY CHARGE INDICATED	M 50.00	HOURLY CHARGE PREDOMINANT			8.00	10.00	12.50	P 7.00	C 4.00 D 4.00	C 3.00 AP 3.00	HOURLY	W 10% P 90%	W 10% P 90%	I 10% P 90%
AV. 25.00 M. M. 15-25	25.00	30.00	35.00	AV. 50.00 M. M. 30-200	H 100%	AV. M 50.00 M. M. 50-75	20.00	10.00	HOURLY	8.00	AV. 12.00 M. M. 10-12.50	16.00	P 5.00	C 3.50 D 5.00		HOURLY	I 50% P 50%	I 50% P 50%	P 70% S 30%
AV. 25.00 M. M. 20-30	30.00	50.00	HOURLY		HRLY. CHG. PREDOM. (PER ACRE. M 50.00 CHARGE INDICATED		40.00	20.00	38.00	10.00	12.50	15.00	P 7.00 A 5.00	C 4.00 D 4.00	C 2.00 AP 2.00	G 10.00 S 6.00 P 3.00	W 10% I 90%	I 90% P 10%	L.L.
AV. 40.00 M. M. 25-75	90.00	75.00	65.00	100.00	H 100%	AV. M 75.00 M. M. 50-100	AV. 40.00 M. M. 25-50	AV. 25.00 M. M. 15-25	65.00	10.00	AV. 12.50 E.TEXAS 15 S " 10.00 W " 12.50 RE " 12.50 N " 15.00	AV. 15.00 M.M. 10-18	P 8.00 A 5.00	C 4.50 D 4.50	C 3.50 AP 3.00	HOURLY CHARGE PREDOM.	I 80% P 20%	I 60% P 40%	I 20% P 80% C 20%
30.00 RURAL 15.00	AV. 40.00 M.M. 25-75	65.00	AV. 35.00 M. M. 20-75	50.00	H 100%	M 50.00 H 15.00	AV. 40.00 M.M. 30-80	AV. 25.00 M.M. 20-40 RURAL 10.00	AV. 45.00 M. M. 40-80 RURAL 20.00	10.00	AV. 12.00 M. M. 9-14	AV. 15.00 M.M. 12.50-18	P 7.00 A 5.00	C 4.50 D 4.50	C 3.00 AP 3.00	G 15.00 S 10.00 P 10.00	W 80% I 20%	W 80% I 80%	W 40% I 60%
$25.00 HOURLY CHARGE PREDOMINANT					H 100%	M 50.00	HOURLY CHARGE PREDOMINANT			7.50	AV. 10.00 M. M. 8.50-11.50	M. M. 10-15.75	P 5.00 A 4.00	C 4.00 D 4.00	C 2.00 A 2.00	G 10.00 S 10.00 P 10.00	S 50% C 40% I 10%	S 10% I 45% P 45%	S 15% I 5% P 80%
40.00	35.00 1% OF ASSESSED VALUE EVIDENT	50.00	AV. 35.00 M. M. 25-55	35.00	H 70% $100.00 1 ST ACRE 1000 EACH ADDL. ACRE	M 50.00 H 7.50	AV. 35.00 M. M. 35-50	AV. 30.00 M. M. 25-35	AV. 40.00 M. M. 35-55	AV. 11.00 M. M. 10-12.50	AV. 15.00 M. M. 12.50-15	17.00	P 7.50 A 6.00	C 5.00 D 5.00	C 4.00 AP 4.00	G 25.00 S 25.00 P 20.00 HR. CH. PR.	L.L.	L.L.	L.L.
25.00	25.00 ES. 125.00	40.00	35.00	65.00	H 100%	M 75.00 H 15.00	HOURLY CHARGE PREDOM.	25.00 ES. 40.00	HOURLY CHARGE PREDOM.	9.00 ES. 15.00	11.00 ES. 19.50	13.50 ES. 24.00	P 8.00	C 6.00 D 6.00	C 2.00 AP 2.00	HOURLY	I 10% P 90%	I 10% P 90%	I 10% P 90%
$ 35.00	HOURLY				H 100%	M 100.00	HOURLY		HOURLY	6.00 3.00 HR. + LABOR	AV. 10.00 M. M. 7.50-12.75	L.L.	P 5.00	L.L.	L.L.	HOURLY	L.L.	L.L.	L.L.
35.00	AV. 50.00 M. M. 40-100	65.00	40.00	75.00	H 100%	M 50.00 H 10.00	35.00	AV. 25.00 M. M. 20-25	40.00	AV. 12.00 M. M. 6-15	AV. 17.00 M. M. 8-20	AV. 20.00 M. M. 10-20	P 7.50 A 6.00	C 5.00 D 5.00	C 3.00 AP 3.00	G 15.00 S 12.50	I 10% P 90%	I 25% P 75%	P 50% C 20% S 30%
AV. 25.00 M. M. 20-35	AV. 30.00 M. M. 20-35	AV. 40.00 M. M. 35-50	25.00	60.00	H 100%	L.L.	40.00	AV. 30.00 M. M. 25-35	40.00	6.00	10.50	13.00	P 6.00 A 5.00	C 4.00 D 5.00	C 4.00 AP 3.00	G 25.00 S 12.00 P 10.00 HR.CH.PR.	I 50% P 50%	W 80% I 50% P 60%	P 100%
J	H		I		J	K	L		M	N						O	P		

MONTANA

L.L.	L.L.	L.L.	L.L.	L.L.	L.L.	← HOURLY AND PERCENTAGE CHARGE PREDOMINANT																	
W 50% P 50%	W 50% P 50%	C 100%	P 50% C 50%	L.L.	H 100%	← HOURLY																	
W 90% I 10%	W 90% I 10%	C 80% S 20%	C 80% S 20%	85	H 100%	$ 7.50	4.00	10.00	3.00	← PERCENTAGE CHARGE →				2.00	2.00	3.00		5.00	10.00	5.00	3.
I 10% P 90%	W 30% P 70%	C 100%	P 10% C 90%	80		$30.00 PER ACRE	15.00	PER FOOT BASIS	10.00	7.50	12.50		5.00	INCL.	10.00	10.00	10.00	INCL.	INCL.	25.00	22.50	2
NOTE: STATE FEE SCHEDULE INCLUDES RECOMMENDED PER LOT CHARGES FOR SUBDIVISIONS																							
I 100%	I 100%	I&C 50% P 50%	I&C 50% P 50%	100	H 90% F 10%	← INSUFFICIENT INFORMATION →														$25.00	10.00	1
W 50% I 50%	W 50% I 50%	C 100%	C 100%	L.L.	H 100%	$30.00	← MIN. 100.00 PER ACRE →	20.00		%	%	%	HOURLY	%	← HOURLY →					AV. $50.00 M.M. 10-100	M.M. 10-75	M
I 50% P 50%	I 60% P 40%	I 30% P 30% C 40%	I 15% P 15% C 70%	50	H 90% F 10%	$10.00	5.00	AV. 12.50 M.M. 5-17.50	10.00	← HOURLY AND PERCENTAGE CHARGES →										AV. $25.00 M.M. 15-25	50.00	1
I 100%	I 100%	I 50% P 50%	I 100%	60	L.L.	$3.50	2.00	5.00	2.00	← HOURLY AND PERCENTAGE CHARGES →										20.00	15.00	
W 50% I 50%	W 50% I 50%	I 20% C 80%	I 100%	75	H 100%	← HOURLY AND PERCENTAGE CHARGES PREDOMINANT																	
I 100%	I 100%	I 90% P 10%	I 100%	L.L.	L.L.	← HOURLY AND PERCENTAGE CHARGES PREDOMINANT																	
W 10% I 40% P 50%	I 40% P 60%	I 10% P 80% C 10%	I 30% P 70%	50	H 50% F 50%	$ 7.00	4.00	10.00	10.00	← 10.00 INCL. →		15.00	7.50	INCL.	← HOURLY →					$ 20.00	15.00	
I 90% P 10%	I 90% P 10%	I 15% C 85%	I 15% C 85%	50	L.L.	← 15.00 INCL. →		← 17.00 INCL. →		%	5.00	%	10.00	8.00	10.00	100	14.00	12.00	10.00			
W 100%	W 100%	S 100%	S 100%	80	L.L.	← $75.00 PER LOT INCL →												$10.00	25.00	15.00			
W 10% P 90%	W 10% P 90%	I 10% P 90%	I 10% P 90%	85	L.L.	← HOURLY AND PERCENTAGE CHANGES PREDOMINANT														$25.00	20.00		
I 50% P 50%	I 50% P 50%	P 70% S 30%	I 50% P 50%	75	← HOURLY AND PERCENTAGE CHARGES →															$10.00	7.00		
W 10% I 90%	I 90% P 10%	L.L.	L.L.	100	L.L.	← $25.00 INCL. →		8.00	2.50	← HOURLY CHARGE PREDOMINANT →				15¢ PER FOOT	15¢ PER FOOT	15¢ PER FOOT		8.00					
I 80% P 20%	I 60% P 40%	I 20% P 60% C 20%	I 20% P 60% C 20%	75	H 90% F 10%	$4.00	4.00	← HOURLY AND PERCENTAGE CHARGES →															
W 80% I 20%	W 80% I 20%	W 40% I 60%	W 50% I 40% BRASS 10%	50	H 80% F 20%	$7.50	7.50	10.00	12.00	7.50	7.50	%	5.00	%	5.00	3.00	5.00	5.00	AV. 20.00 M.M. 10-30	20.00	15.00		
20% 50% 30% 40% 50% 10%	S 10% I 45% P 45%	S 15% I 5% P 80%	S 10% I 5% P 80%	25	H 100%	← HOURLY AND PERCENTAGE CHARGES PREDOMINANT																	
L.L.	L.L.	L.L.	L.L.	100	H 90% F 10%	$15.00	7.00	15.00	AV. 10.00 M.M. 5-15	25¢ PER FOOT	30¢ PER FOOT	30¢ PER FOOT	15¢ PER FOOT	HOURLY	15¢ PER FOOT	15¢ PER FOOT	15¢ PER FOOT	HOURLY	$16.00	AV. 30.00 M.M. 25-40	25.00		
I 10% P 90%	I 10% P 90%	I 10% P 90%	I 10% P 90%	L.L.	L.L.	← STATE FEE SCHEDULE RECOMMENDS $75.00 PER LOT MINIMUM AND $140.00 PER LOT FHA SUBDIVISION PLUS PERCENTAGE																	
L.L.	L.L.	L.L.	L.L.	L.L.	← HOURLY →																		
I 10% P 90%	I 25% P 75%	P 50% C 20% S 30%	P 80% S 20%	50	H 50% F 50%	3.00	2.00	6.00	AV. 10.00 M.M. 5-25	15¢ PER LINEAR FOOT	15.00	%	6.00	INCL.	10.00	10.00	10.00	7.00	L.L.	AV. 20.00 M.M. 10-25	15.00		
I 20% P 80%	W 20% I 20% P 60%	P 100%	P 100%	50	H 90% F 10%	$ 8.00	10.00	10.00	5.00	10.00	5.00		5.00		10.00	10.00	5.00	10.00	5.00	8.00	5.00		
P				QA		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14		Q15		

MONTANA

HOURLY →				$8.00	20.00	17.50	30.00	12.50	L.I.	$8.00	NO 50%		T 5	O 50%			MONTANA
CHARGES PREDOMINANT →									L.I.	L.I.	YES 50% NO 50%	SF 100%	L.I.	H 50% O 50%	M 100%	NO 100%	NEBRASKA
									NON-UNION $80.00	L.I.	YES 50% NO 50%	SF 80% P 20%	F 6 O 2 T 8	H 20% O 80%	B 80% R 20%	YES 30% NO 70%	NEVADA
2.00	3.00		5.00	10.00	5.00	3.00	5.00	3.00	L.I.	10.00	YES 100%	SF 100%	F 3 O 1 T 4	H 100%	B 100%	YES 10% NO 90%	NEW HAMPSHI
10.00	10.00	INCL.	INCL.	25.00	22.50	20.00	25.00	25.00	125.00	25.00	YES 100%	SF 100%	F 6 O 1 T 7	O 100%	B 80% R 20%	YES 100%	NEW JERSEY*
ES FOR SUBDIVISIONS																	SOCIETY OF PROF. ENGR.,SU
→				$25.00	10.00	10.00	15.00	10.00	AV. 125.00 PLUS % M.M. 65-150	10.00	YES 70% NO 30%	SF 80% P 20%	F 4 O 2 T 6	H 50% O 50%	B 80% R 20%	NO 100%	NEW MEXICO
HOURLY →				AV. $50.00 M.M. 18-100	M.M. 18-75	M.M. 15-60	15.00		L.I.	15.00	YES 50% NO 50%	SF 100%	F 6 O 3 T 9	H 50% O 50%	B 100%	YES 100%	NEW YORK + (SEE SCHE NASSAU SUFFOLK CIVIL ENGIN CENTRAL N.Y. SOCIETY OF LAN SUR. ASSOC. OF QUEENS BOROU
CHARGES →				AV. $25.00 M.M. 15-25	30.00	12.50	15.00	10.00	65.00 PLUS CONSTRUCT LAYOUT AND DESIGN	2.50	YES 80% NO 15%	SF 80% P 20%	F 6 O 3 T 9	H 40% O 60%	B 85% R 15%	YES 40% NO 60%	NORTH CARO
CHARGES →				20.00	18.00	10.00	10.00	7.50	L.I.		NO 100%	SF 50% P 50%	F 3 O 1 T 4	H 100%	B 10% R 90%	YES 90% NO 50%	NORTH DAKO
PREDOMINANT →									L.I.	20.00	L.I.	SF 100%	L.I.	O 100%	B 100%	L.I.	OHIO
PREDOMINANT →											YES 10% NO 90%	SF 100%	F 5 O 3 T 8	O 100%	B 50% M 50%	NO 100%	OKLAHOMA
HOURLY →				$ 20.00	15.00	15.00	20.00	15.00	125.00	AV. 30.00 M.M. 15-40	YES 75% NO 25%	SF 70% P 30%	F 6 O 3 T 9	H 40% O 60%	B 70% R 30%	YES 70% NO 30%	OREGON
8.00	10.00	100	14.00	12.00	10.00	10.00			110.00	12.50	YES 50% NO 50%	SF 100%	F 6 O 3 T 9	O 100%	B 70% R 30%	L.I.	PENNSYLVANI
			$10.00	25.00	15.00	12.50	25.00	15.00	100.00	10.00	YES 50% NO 50%	SF 50% P 50%	F 3 O 2 T 5	H 50% O 50%	B 70% R 30%	NO 100%	RHODE ISLAN
EDOMINANT →				$25.00	20.00	20.00	25.00	20.00	L. L.	10.00	YES 25% NO 75%	SF 90% P 10%	F 3 O 1 T 4	H 10% O 90%	B 100%	L.I.	SOUTH CARO
→				$10.00	7.00		7.00	5.00	L.I.		YES 50% NO 50%	P 100%	F 8 O 3 T 11	H 100%	B 100%	NO 100%	SOUTH DAKO
R 15¢ PER FOOT	15¢ PER FOOT		5.00						65.00	10.00	YES 10% NO 90%	SF 50% P 50%	F 5 O 2 T 7	H 60% O 40%	B 60% R 40%	NO 100%	TENNESSEE
RGES →									125.00	AV. 15.00 M.M. 10-20	YES 50% NO 50%	SF 100%	F 6 O 2 T 8	O 100%	B 80% R 15%	YES 70% NO 30%	NOTE: STATE DIVIDED INTO SECTIONS FOR CERTAIN GU TEXAS * (SEE T
	3.00	5.00	5.00	AV. $30.00 M.M. 10-30	20.00	15.00	12.50	AV. 15.00 M.M. 10-25	AV. 100.00 M.M. 50-120	10.00	YES 20% NO 80%	SF 70% P 30%	F 6 O 2 T 8	H 65% O 35%	B 75% R 25%	YES 20% NO 80%	SURVEYORS ASSOC. FEE S UTAH * (SEE STATE MOUNTAIN IN OF CONSULTING ENGINEERS LAKE CITY FEE SCHEDUL
ANT →									75.00	HOURLY	NO 100%	SF 65% P 35%	F 3 O 1 T 4	H 35% O 65%	B 50% R 30%	YES 80% NO 20%	VERMONT
ER 15¢ PER FOOT	15¢ PER FOOT	15¢ PER FOOT	HOURLY	$18.00	AV. 30.00 M.M. 25-40	25.00	15.00	25.00	15.00		22.50	YES 50% NO 50%	SF 100%	F 6 O 3 T 9	H 30% O 70%	B 100%	YES 100%	VIRGINIA (STATE FEE SCHEDULE
0.00 PER LOT FHA SUBDIVISION PLUS PERCENTAGE FOR DESIGN →									140.00	25.00	YES 30% NO 70%	SF 80% P 20%	F 3 O 1 T 4	H 90% O 10%	B 80% R 20%	YES 75% NO 25%	P. S. RECENTLY ADOPTED WASHINGTON ASSOC. OF WASH FEE SC
→									L.I.		NO 100%	SF 100%	F 4 O 2 T 6	H 50% O 50%	B 90% R 10%	YES 50% NO 50%	WEST VIRGIN
00	10.00	10.00	7.00	L.I.	AV. 20.00 M.M. 10-25	15.00	10.00	18.00	15.00	90.00	L.I.	SF 100%	F 9 O 6 T 15	H 100%	B 90% M 10%	YES 100%	WISCONSIN
0	10.00	5.00	10.00	5.00	8.00	5.00	5.00	8.00	5.00	95.00	10.00	YES 60% NO 40%	SF 80% P 20%	F 7 O 2 T 9	H 50% O 50%	B 50% R 50%	NO 100%	WYOMING * (SEE OF PR ENGR. & SURVEYORS FEE
0	Q 11	Q 12	Q 13	Q 14	Q 15			Q 16		R	S							

MONTANA

NEBRASKA

NEVADA

NEW HAMPSHIRE

NEW JERSEY* (SEE N.J. SOCIETY OF PROF. ENGR. SURV. MANUAL)

NEW MEXICO

NEW YORK + (SEE FEE SCHEDULES: NASSAU SUFFOLK CIVIL ENGINEERS, INC. CENTRAL N.Y. SOCIETY OF LAND SURVEYORS SUR. ASSOC. OF QUEENS BOROUGH, INC.)

NORTH CAROLINA

NORTH DAKOTA

OHIO

OKLAHOMA

OREGON

PENNSYLVANIA

RHODE ISLAND

SOUTH CAROLINA

SOUTH DAKOTA

TENNESSEE

NOTE: STATE DIVIDED INTO FIVE SECTIONS FOR CERTAIN QUESTIONS

TEXAS * (SEE TEXAS SURVEYORS ASSOC. FEE SCHEDULE)

UTAH * (SEE STATE & INTER-MOUNTAIN INSTITUTE OF CONSULTING ENGINEERS OF SALT LAKE CITY FEE SCHEDULES)

VERMONT

VIRGINIA (STATE FEE SCHEDULE PROPOSED)

WASHINGTON * (SEE LAND SURVEYORS ASSOC. OF WASH FEE SCHEDULE) * RECENTLY ADOPTED

WEST VIRGINIA

WISCONSIN

WYOMING * (SEE WYOM. ASSOC. OF PRACTICING ENGR. & SURVEYORS FEE SCHEDULE)